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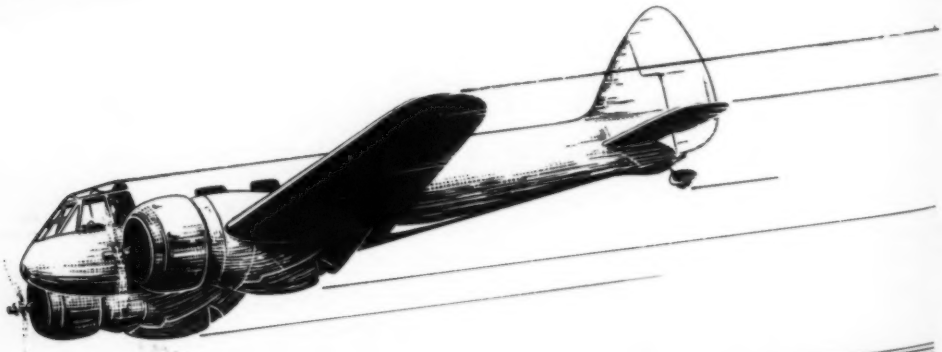

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FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

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Safer Service Flying

THE last few weeks have seen a very deplorable number of fatal flying accidents to R.A.F. personnel, and certain sections of the Press with morbidly statistical minds delight to inform their readers of the total fatalities since the beginning of the year. It has been said that statistics are the worst form of lie, and a bald statement of accidents can certainly give a very false impression. They may seem to imply that the Royal Air Force is a very dangerous profession, and that parents would be wise to prevent their sons from joining it.

Let us face those figures, not in a callous frame of mind—for every death of a young man is a tragedy—but in order to see whether the work of a pilot in the R.A.F. does entail an undue amount of danger. When estimating risks the only fair method to adopt is to take the number of fatal accidents, not the number of deaths, for the crash of one large machine may cause a number of fatalities. Up to July 22 of this year there have been thirty-three fatal crashes in the R.A.F., seventeen at home and sixteen overseas. Between them these have caused sixty-six deaths. Four of these accidents occurred during initial training, two at civilian schools and two at R.A.F. Flying Training Schools. There have also been eight lives saved by parachutes.

Some ten years ago, when the Royal Air Force was very much smaller than it is now, there was one very bad year when the number of fatal crashes was greater than the number in 1935. It is misleading to compare one year with another, because chance plays such a large part in swelling the figures of one year and reducing them the next. One should reckon in periods if one is to get a true picture of increasing or diminishing risks.

The degree of risk run by one pilot must be considered in proportion to the number of pilots flying and the number of hours flown. It is not possible to give the average number of hours flown by each pilot in the course of a year at the present time, but it can safely be said that every year a pilot spends more hours in the air than he did the year before. It goes without saying that the total of hours flown by R.A.F. pilots has increased greatly of late. When the expansion started in 1934 there were about 2,000 pilots in the Service. There are now 3,000, as well as 1,300 under instruction. It is obvious, therefore, that the odds in favour of any individual pilot leading a long life and ultimately dying in his bed are very much greater than they were a few years ago. One may go further and say that those odds are now long odds. Even without knowing the exact figures one can see that the degree of risk on any flight (presuming no abnormal circumstances) is so slight that no one would worry about it. Flying in the Service is growing steadily safer.

Thorough Training

The increasing degree of safety is hardly to be wondered at when one considers the extreme care taken during training. There are now no unqualified instructors, as there were during the war years. Training is all done on a system, and every instructor has to pass through the Central Flying School and absorb its methods before he is allowed to teach pupils to fly. The machines are very sound, and it is a long time since any accidents were caused through a Service aeroplane breaking in the air. A flying pupil is under instruction for about a year. First he goes to a civil training school, where he puts in fifty hours in the air. Of these, twenty hours are dual, six are for instruction in instrument flying, and twenty-four are solo. Then he goes on to one of the R.A.F. Flying Training Schools, where his preliminary training is completed and he qualifies for his "wings." At all stages he is liable to revert from solo to dual flying, to see that he is not developing faults. Up till a short time ago the pilot was sent off to a squadron as soon as he got his "wings," and in the squadron was put through a further

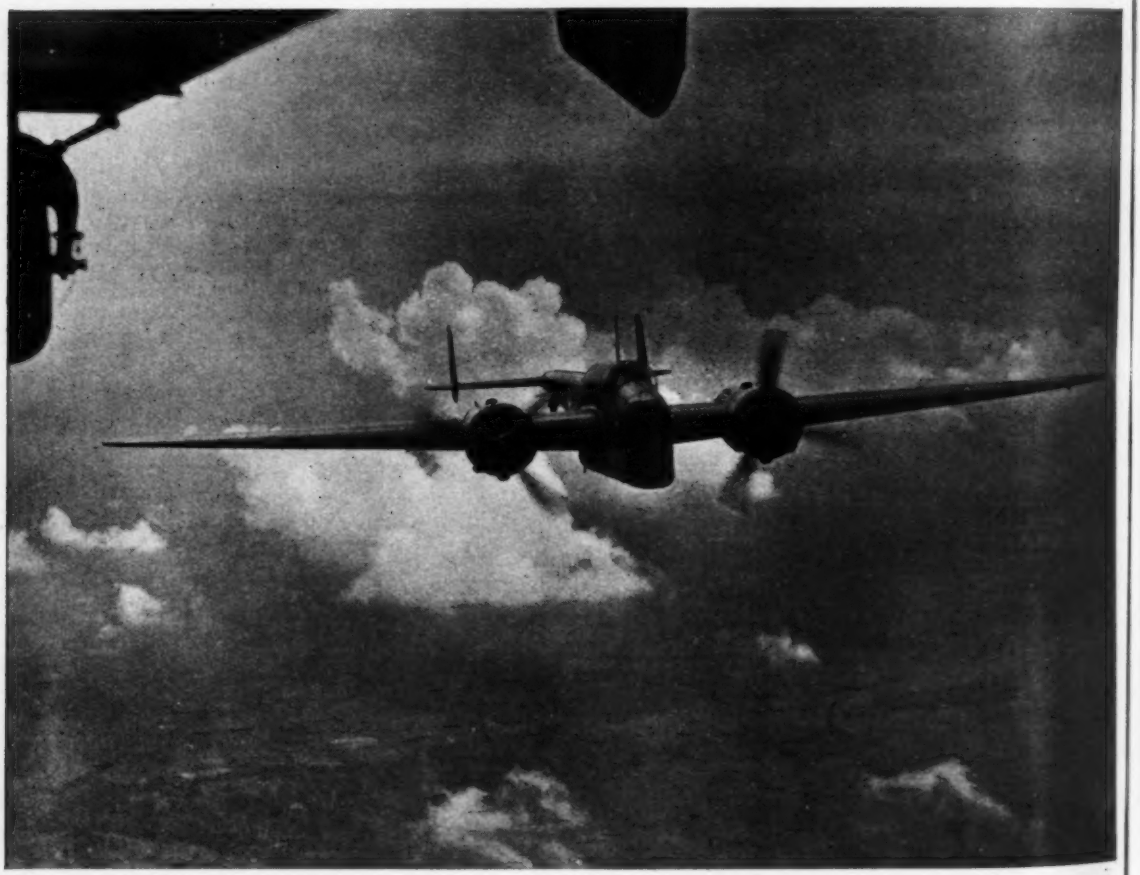
course of individual training, such as armament flying (i.e., using his machine guns in the air), formation flying, etc. This delayed the year's work of the squadron, and so under the new arrangement the newly fledged pilot is kept on at the F.T.S. for a post-graduate course. The F.T.S. now gives him thorough instruction and practice in night flying, for under the new rules every R.A.F. pilot has to be able to fly in darkness. Previously hardly anyone except the men in heavy bomber and certain fighter squadrons was practised in night work. All this post-graduate course is carried out under the highly qualified instructors at the Flying Training Schools.

With more pilots and more flying the chances of more accidents are naturally increased, but when the accidents increase at a much smaller rate than does the amount of flying, it does not need a mathematician to prove that Service flying is, as was said above, growing steadily safer.

Getting Together

WHILE politicians argue interminably, without seeming to get anywhere in particular, flying folk of more than a dozen countries have been quietly building up and strengthening a new "Entente Cordiale" during a week-end in England, and have, in a small way, made progress where the political parties seem to have come to a standstill. Representatives of these countries have seen portions of England together, have lunched and dined and taken wine together, have danced and generally enjoyed themselves together, and have come to know and like one another. As M. de Skorzewski said at the official banquet, the visitors had felt absolutely at home and among friends. Sir Philip Sassoon expressed the feeling admirably when he said that the wider meaning of "Entente Cordiale" was understanding between the people of all those nations who saw in the coming of flying an opportunity for closer and more friendly relations between those whom in past generations time and distance separated. The real race was not a race in air armaments, but a race between those who thought of flight in terms of military strength and those who saw in it a new instrument of international intercourse. Every gathering of the nature of the Week-end Aérien does something towards the strengthening of friendship and the fostering of peace.

The Royal Aero Club did well in getting together so many visitors from abroad. The weather did its best to prevent some of them from arriving, but, in spite of all difficulties and handicaps, the 1936 Week-end Aérien must be written down a great success. It is to be hoped that it will be followed by many more.



SLIM AND DARK: Off the ground, and with wheels retracted, the new Handley Page medium bomber (two Pegasus engines and C.P. airscrews) has a sinister beauty of line. For this photograph—the first taken with wheels up—the machine was "posed" by Capt. J. B. L. H. Cordes, the makers' chief test pilot. (*Flight* photograph.)

The Outlook

A Running Commentary on Air Topics

Amalgamation

FOLLOWING the leading article in last week's issue on the booking anomaly and, more important still, our editorial comment on South Atlantic possibilities in *Flight* of June 11, the news of the proposed amalgamation between British Airways and British Continental Airways and of their subsequent plans comes at a particularly opportune moment.

In the June issue we stressed the absolute necessity for co-operation or amalgamation between any companies with West African or South Atlantic projects, and the statement of the amalgamation was immediately followed by the news that the Air Ministry had already decided to help in the establishment of a very necessary South Atlantic service.

So far as the booking problem is concerned, it is obvious that two companies with such strong interests involved will have all the necessary political and financial backing to obtain what they want. In general, *Flight* is opposed to big merger companies, for the simple reason that some competition, in the present state of human development, may be necessary for real progress. In the present condition of airline affairs, however, there appears to be a choice of two ends only—co-operation or extinction. For the moment there is competition enough and to spare in this airline business.

Many times previously we have remarked also on the absurdity of competition over one route, and now, at least, there will be no duplication on the Scandinavian service. We look on this amalgamation as one of the most, if not *the* most important air transport development since the formation of Imperial Airways.

From the Inside

FLIGHT is very glad to give space this week to an article (pages 142-144) on the organisation of the King's Cup Race, from the pen of Major Alan Goodfellow, who is a member of the Racing Committee of the Royal Aero Club and was Clerk of the Course for this year's race. It is always interesting to hear the other man's point of view, and it is, unfortunately, all too rarely that an organiser can be persuaded to state his views in the way Major Goodfellow has done.

It might be pointed out that although the article was prompted by certain criticisms which have appeared in *Flight*, it deals with a good many which we have not published; it is, in fact, an endeavour to cover all the more important criticisms made during a period of years, and in the main the arguments advanced are very sound.

One point which is not dealt with by Major Goodfellow deserves some attention. Most people will agree with him that an air race for a cup presented by His Majesty should be organised to have as wide a public appeal as possible. But the best method of ensuring this is open to debate. *Flight* has long held the view that, no matter how the rules and regulations are drafted, the general public in the London area is not likely to be interested to the tune of thousands. The experiment has been made of having the starting and finishing point in the provinces, and this experiment might, with advantage be repeated. After all, the prefix "Royal" confers obligations as well as privileges on the Aero Club, which exists for the benefit not merely of the London area but the whole country. Next year it might be well to have the starting and finishing point at the aerodrome of one of the larger provincial towns. That would help towards ensuring a larger attendance, and if the circuit in the eliminating trials were to cover other towns which do not frequently enjoy the opportunity to see racing aeroplanes, the total attendance would probably be quite large. *Flight* does not find fault with Hatfield if the race is to start and finish near London; in fact, Hatfield is very nearly ideal. But the London public will not go there in large numbers.

"Eight Hours of 'Ate"

THE suggestion that the King's Cup Race might be reorganised on a totally different basis and flown somewhat on the lines of the French *Douze Heures d'Angers* is touched upon by Major Goodfellow. We share his views that the British race should not be altered in character to this extent, but we do think that such an event ought to be included in the list of annual British flying contests, not as a substitute for the King's Cup Race but as an additional air race. The S.B.A.C. should be approached with a view to getting a prize fund established, and it should not be difficult to persuade the council that an annual race for prizes offered for the greatest distance covered in a given period of time, with division of competing machines into classes according to engine size, would provide a welcome incentive to manufacturers of small and large types alike.

Whether or not an annual British air race of this nature should follow the French example absolutely would be a matter for discussion among those directly interested. Certainly the French system has the merit of simplicity. In each class it is a case of "Here's an engine of such and such capacity; build a machine around it and do your best (or worst)." As time spent in refuelling counts as flying time, the aircraft designer can give his machine a very short range, in which case he must be prepared to have it landed and taken off a number of times, or he can give it a reasonable range and save the time spent in refuelling, as well as the possibility of damage several times during the race period. Major Goodfellow's humorous suggestion that the race might be known as "eight hours of aerial 'ate" contains more than fun. For the first race, at any rate, it might be well to reduce the period to something less than the twelve hours. This year's French race had, in fact, to be flown on a six hours' basis instead of a twelve, on account of very bad weather conditions.

Small Air Exercises

CONSIDERING how preoccupied the R.A.F. has been with the expansion scheme, to which the absence of several squadrons in Mediterranean lands has been a nuisance and an interruption, it is rather striking that it should have been found possible to hold any air exercises this year. That the effort has been made, and some twenty squadrons have been concentrated for the sham fighting of attack and defence, shows how very important these exercises are. The actual fighting, of course, proves nothing, and casualties are not assessed; but the need for constant practising of the whole defence organisation, to say nothing of the tactics of bombing attack, cannot be over-estimated. The exercises began on Monday, Tuesday was a blank day, while a period of continuous raiding for forty-eight hours began on Wednesday at 15.00 hours. The targets by day were the aerodromes of Biggin Hill, Hornchurch, and North Weald, while by night only the two Essex aerodromes were attacked. London was allowed to sleep in peace.

THE WEEK-END AERIEN

British Private Owners Return Continental Hospitality : Eighty-five Machines from Thirteen Countries : A Rainy but Successful Affair

THE much looked-forward-to, unbeautifully named "Week-end Aérien," in which British private aircraft owners, through the hospitality committee of the R.Ae.C., endeavoured to return the hospitality of their Continental confréres, has come and gone—in a smother of low clouds and rain for part of the time, but equally in a wonderously cheery and friendly atmosphere. Of its success there was no doubt. Eighty-five aircraft from 13 countries arrived, carrying 145 people.

Those concerned with the reception of the foreign guests last Thursday—and particularly those who are themselves pilots—must have suffered mental agonies as they examined the low cloud-base and felt, or heard, the intermittent rain. For some reason best known to themselves, the English people always think that Continental private pilots are unused to really bad weather, and on this occasion they imagined that the Gallic squadrons, at least, might, in their endeavour not to disappoint us, try to push through.

Certainly, the reports were depressing enough. At two o'clock Croydon gave the cloud heights as 300ft. at Lympne, 200ft. at Penshurst and *ninety feet* at Biggin Hill.

If anyone came at all, it was obvious that he or she would have to use the Dorking gap in the Surrey Hills—or make a tour of Essex and Hertford after finding a valley in the North Downs. Both Croydon and Heston were Q.B.I., though, admittedly, the latter was only so ordered to prevent unnecessary departures by our own unimportant nationals. It is significant that a British Airways' D.H.86*A* from Amsterdam was D/F-ed into Heston because Gatwick was too difficult for safety.

In the "foreign" park at Heston were three machines which had arrived on the previous day—an Austrian tapered Hornet brought by Herr Stephan Karpeles-Schenker; a "square" Hornet from Spain with Sen. Juan Pruneda and Capt. Morato; and an Eagle owned and flown by Consul Müller with Mme. Müller as passenger. This Eagle was previously owned by Lord Willoughby de Broke and won the S.B.A.C. Trophy race last year.

The first visitor to get through on Thursday was Herr Otto Stinnes (Klemm K.132b, with a Siemens engine), who arrived early enough to have missed the very worst. He flew from Amsterdam, via Redhill, and reported good weather on the Continent. At 2.40 p.m. we heard that there were already seven machines at Lympne, and a little later Mr. Schmidt Crans and his party roared over with a Waco (Continental), followed later by a dual-control Koolhoven FK.41 from the National Flying School at Rotterdam, with Messrs. Van Alphen and D. S. Asjes (the England-Australia Pander pilot, now instructing).

. . . *and Unsung*

Already great work was being done by the College of Aeronautical Engineering students, the A.A. Scouts, and, of course, by Mrs. Norman and her helpers in the Customs department. A pity, perhaps, that the visitors' first glimpse of an otherwise attractive airport should be of a hencoop, inexplicably labelled "Repairs Office" in three languages, with the word "School" in faint tones beside it. In the west hangar, where the Customs disported themselves, the G.E.'s at work on 5c4 Ns sang and whistled in unison with the myriad birds fluttering in the roof.

Just when we were all wondering whether the Folkestone

trains could be stopped at Stanford station, near Lympne, for the benefit of those who could be dragged away from the Cinque Ports' hospitality, it was learnt that no fewer than fifteen machines were somewhere in the air between Lympne and Heston. The control officers must have mopped their brows. At 4.30 p.m. M. Provost's Leopard arrived, and very shortly afterwards a Brussels Club Stampe et Vertongen S.V.-4 (with enclosed cockpits reminiscent of the coupé Gipsy) came in with Count Jacques d'Ursel and Baron R. de Vinck de Winnezeele.

Someone or other volunteered the information that three machines, a biplane and two high-wing monoplanes, had been seen chasing up and down the hills searching for the Dorking gap. Whoever they may have been, it was not long afterwards when two Swiss machines, a Leopard and a Puss, turned up carrying, respectively, and among others, Major Nabholz and Col. E. Messner. The biplane may have been the Heinkel Kadett, flown by Capt. A. von Winterfeldt, which made its circuit as a beautiful vertical turn. Although we did not see him, it appears that Georges Hanet (Caudron Frégate) completed the sum of Thursday's arrivals.

On the following day we heard something of the way in which our climate had attempted to undo the good work of the Aérien, though, fortunately, without any grim results. The worst incident concerned the forced landing made by the second S.V.4 between Dymchurch and Littlestone owing to fuel shortage. Mr. Bentley, of Shell, after taking a pilot down to Lympne to collect his machine, did his best to assist. M. Delbes (Caudron Super-Phalène) damaged his airscrew at Penshurst. Apart from these two cases all was well—which is surprising enough when it is remembered that, later in the day, even Lympne could not be entered. In all, nine people put down at Lympne on Thursday, six at Penshurst, three at Hawkinge, and one at Littlestone. One, who shall be nameless, pulled off a beautiful forced landing at Shorncliffe Camp, near Hythe, and was so well entertained in the mess that there was some difficulty about his eventual removal to less unorthodox quarters.

Bringing Them In

But the stories of the eighty-odd machines which eventually arrived would fill a book. Hunting them up was like searching for eighty needles in a large haystack. Only the indefatigable Press secretary at Heston had firm knowledge of their whereabouts (obtained from that source of all true knowledge, the control tower). The Royal Aero Club had, officially, no ideas whatever, though, no doubt, someone knew something, somewhere.

Little by little, with the help of people such as Mr. Gordon Selfridge, who flew his Dragonfly to Lympne with four pilots, all the machines were collected and Friday's arrangements were carried out according to plan. These consisted, pleasantly enough, of a visit by air to either Oxford or Cambridge. We elected to go to Cambridge and, after hanging about at Heston until 11.30 a.m. in an endeavour to

The Guests Arrive : Above, the machines at Heston (*Flight* photograph); above, Capt. A. von Wirterfeldt, the pilot of the Heinkel Kadett, and Dr. Robert Henschel are welcomed; right, Col. E. Messner and others have their luggage brought in by the ever-helpful students of the College of Aeronautical Engineering. (*Flight* photograph.)

An impressive view of the Focke-Wulf Stösser flown by E. Kropf, the famous German aerobatic pilot, who entertained the visitors at Ratcliffe on Sunday. (*Flight* photograph.)

discover how everyone was being delivered and whether the parties were still travelling by air (and after motoring to Hatfield to collect an aeroplane), the strong south-west wind was appreciated. In bumps of no mean magnitude, Fen Ditton was reached in sixteen minutes' flying time—just in time to catch the penultimate bus to lunch at Trinity, where Mr. Lindsay Everard, who had flown up from Gravesend in his Vega Gull, was waiting to receive the party, which included, as *O.C.*, Mr. Nigel Norman, who had flown his Leopard from Heston. Airwork, in fact, one way and another, was contributing a very great deal to the success of the whole week-end party.

After lunch the visitors, who now numbered about fifty at Cambridge, were taken around by guides who were, for the most part, Fellows of the Universities. Each guided party consisted of only five or so, and the tours were very personally conducted indeed. Our particular guide was a lecturer in economics who had, during the last war, flown F. boats and, later, acted as test pilot to Short Brothers! In the party was Capt. von Winterfeldt, who had, too, been a war pilot after serving at an unconscionably early age in the infantry, and he found points of contact with Mr. Ord, the organist of King's College Chapel and a Fellow of the college, who was also a pilot in those better-forgotten days. Such meetings made one realise both the futility of war and its monumental waste of good men and friendly feelings.

It is significant that, however charmed the visitors were with the beauty of the architecture, of the green vistas and the quietly flowing Cam with its bridges, they should show the greatest interest in the most modern of all buildings, the new University Library which, like the British Museum and the Bodleian at Oxford, is entitled to a copy of every book and magazine published in Great Britain. There are forty-three miles of steel shelves and space for another thirty-five years—which may be long

On the left is Prince Constantin Soutzo, standing in the cockpit of the Icar Universal, which is shown below being started before a trip to Oxford. The machine at the foot of the page is M. Eugene Wittinne's Caudron Simoun, which was flown by M. Vanlaere.

Some personalities : Above, on the left, are Mme. P. du Jardin and M. Edmond Leon, who came in the original Moth Major. Top right, is a Caudron Simoun party ; from left to right these are Mme. Meny, M. and Mme. Eugene Wattinne and M. Vanlaere Below (left), Mrs. Nigel Norman, who appeared to be a very efficient and cheery " O.C. everything " at Heston and elsewhere, is telling Mlle. Viviane Elder that her quarantined fox cub will be well looked after by the Customs, who are used to housing such pets. On the right is Miss Bessie Owen, a visitor from the U.S. (*not* direct by air), in the cabin of her Waco.

enough at the present rate of retrogression in Western civilisation.

So to tea, for some of us, at Sidney Sussex College, back to the aerodrome and to London, dodging rainstorms on the way, where a reception had been arranged at Londonderry House. The affair, though theoretically formal, was actually very cheery, and Lord Londonderry, as the enthusiastic owner of a Hornet Moth, was on congenial ground with his private-owner guests.

By Friday morning practically all the expected visitors had arrived and one or two, including M. and Mme. Guy Hansez, were actually picked up at Heston by the coaches on their way to Great Fosters and Eton. The organisers could not have picked a better spot than the former to show the best and least recognisable of those typically English institutions—road houses. Great Fosters is an Elizabethan mansion and the Queen herself stayed there—though there was no warmed swimming pool then, nor had Dry Martinis been invented.

After lunch the coaches moved on to Eton, via Windsor, while we endeavoured to explain in imperfect French that King Edward had his own machine and his own landing ground at Sunningdale. Eton, of course, caused interest of the gayest and gravest kind. Sheer antiquity, unaltered traditions, famous names carved by the thousand (at 10s. a time), a mildly ecclesiastical atmosphere produced gravity, while the astounding variations in official costume effected by the boys produced some minor gaiety—though none of the visitors were so ill-mannered as to show it. Almost without exception, the French contingent demanded to see the place where the battle of Waterloo was won, and one or two asked to have the famous Wall Game explained to them. Most were bemused by the Upper and Lower School explanations, staggered by the much-carved fifteenth-century desks where work is still carried out, and entranced by the sight of one boy wearing an open cricket shirt, the standard black overcoat, a furry topper, and reading the evening paper with an appearance of complete boredom.

The Banquet

And so, on Saturday evening, to the official banquet at Grosvenor House. Sir Philip Sassoon, proposing "The Guests," said: "The Entente Cordiale had its origin as the name given to an understanding between France and Great Britain, which proved that friendship was stronger than treaties. The expression has now, I rejoice to think, a wider meaning. It stands to-day for good feeling and understanding between the people of all nations who see in the coming of flying an opportunity for closer and more friendly intercourse between those whom in past generations, time and distance separated." This sentence sums up neatly the spirit which permeated the week-end. Sir Philip added that the affair was of more than national significance; it was an occasion when those who came together were, for the time being at least, not French, German, Austrian, Dutch, Swiss, Spanish, English, or any other nationality, but just brethren of the air.

Replies to Sir Philip's speech of welcome were made by Prince Bibesco (Rumania) in French, M. J. Meny (France) in English, Herr F. Florian (Germany) in German, General Baron Wahis (Belgium) in French, Mijnheer C. Kolff (Holland) in English, His Excellency the Austrian Minister, in

Ratcliffe, Mr. Lindsay Everard's private aerodrome, snapped from the cabin of a temporarily editorial Hornet Moth. The visitors' machine park is just visible. (*Flight* photograph.)

English, Col. E. Messner (Switzerland) in English, and M. Bernard de Skorzewski (Poland) in English.

Prince Bibesco recalled that when he visited England in 1931 it was almost necessary, if one travelled by air, to have a second aeroplane to carry all the documents required. The number of formalities was now much smaller, thanks largely to the work of the Royal Aero Club of Great Britain. Monsieur Meny, in a very amusing and witty speech, caused much amusement by apologising for his accent—he had never been to Oxford until the previous day!

Mr. Kolff referred to English traditions and said there was one which the visitors did not like—the weather was always the same for the Week-end Aérien. The organisation had been marvellous. As an example he quoted the case of a friend of his who, when they arrived at their destination on one of the outings, discovered that he had lost a much-prized walking stick. He was greatly perturbed, but when they returned to their hotel that evening there was the stick, "There's organisation for you!" said Mr. Kolff.

M. de Skorzewski said he had read in that week's issue of *Flight* that British private owners had, on visits to the Continent, met almost embarrassing hospitality. The Week-end Aérien visitors to England did not feel embarassed at all. On the contrary, they felt at home and among friends. On that note the banquet came to an end, and guests and hosts enjoyed the following dance.

At Ratcliffe

In many ways the party on Sunday at Mr. Lindsay Everard's aerodrome at Ratcliffe, Leicester, was the high spot of the whole week-end. It was good that the visitors should have a chance of seeing the last word in privately equipped aerodromes, and the weather was fine enough to encourage almost all the foreign pilots to delay their departure for a few hours. Actually, more British than foreign machines arrived, and the park was soon chock-a-block.

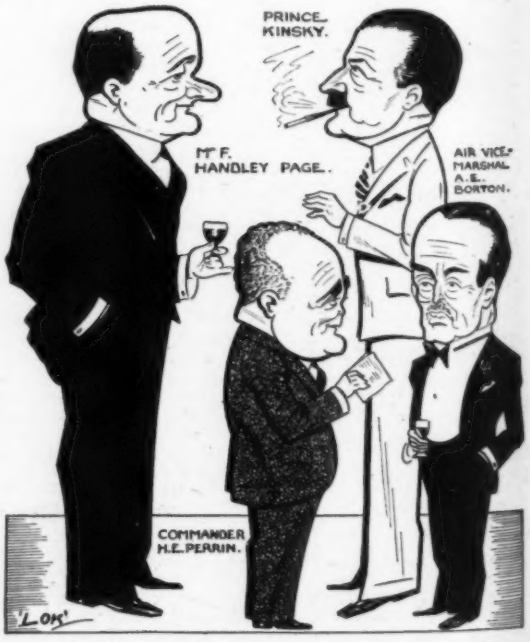
With, among very many other distinguished guests, the Duchess of Bedford, Viscount Swinton (who, as usual, arrived in a Hart of No. 24 Squadron), the Marquess of Londonderry (who came with Lady Londonderry in the demonstration Envoy flown by Flt. Lt. Colman), and Sir Francis and Lady Shelmerdine (arriving in a Rollason Leopard flown by Mr. Nash) present, the affair was of singular interest. Mr. Everard had most thoughtfully arranged for a Customs tent, Mr. J. J. Jeffs handled the traffic and Lt. R. L. Preston, from his control tower eyrie and with the help of a British Aircraft Register, kept us fully posted with information about this traffic.

When we ourselves landed the wind was blowing across the shortest run, but, fortunately, it changed round so that the majority of the arrivals could use, if necessary, the whole length of the aerodrome, ground traffic on the approach road being regulated when necessary. As a matter of fact, the faster machines could, even if the wind had remained as at first, have landed in the other part of the aerodrome, though this would have entailed about a mile of taxying.

Apart from sundry heart-stopping moments while half a dozen machines were making, or were about to make their approach, everything went off smoothly, though never before can there have been so many machines at Ratcliffe. The most impressive occurences from the flying point of view were the arrival of three Caudron Simouns (Hansez's, Wattinne's and Gerard's) in close formation at zero altitude and 200 m.p.h., and the aerobatic display after lunch by Dipl. Ing. Kropf, the German pilot, in his Focke-Wulf Stösser monoplane. His crazy take-off, in almost vertical bank but no turn, was alone worth the visit. Flt. Lt. Clarkson's efforts in the same machine, immediately afterwards, were even more remarkable when it is known that he had not previously been even in the cockpit of the Focke-Wulf.

After the luncheon short and apt speeches were made by Prince Bibesco, by Mr. Lindsay Everard (in reply) and by Lord Swinton.

So, in good weather and on an extremely cheerful note, the Week-end Aérien terminated. Let us hope that it will be an annual event and that, next year the "best weather but the worst climate" will not cause quite so much anxiety.



A caricaturist's impressions of some personalities at the cocktail party at the R.Ae.C. on the first evening of the Week-end. Prince Kinsky is president of the Austrian Aero Club.

THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

IT is hoped that before the end of the year the Australian Government's order for thirty-six Ansons and thirty-six Demons will have been fulfilled by the British manufacturers.

Italy is to open a new air-line to connect Rome with Massawa, Italy's port on the Red Sea.

Southern Rhodesia is holding its first air rally at Salisbury on August 15.

The R.A.F. and, it is believed, the South African Air Force, will be represented.

Model aircraft will, as usual, figure largely in the Model Engineer Exhibition, which takes place at the Royal Horticultural Hall, Westminster, from September 17 to 26.

Another interesting item in the Exhibition will be the special Royal Air Force Display showing the methods of technical training of apprentices.

The French Government has warned the directors of the Potez Company that if they wish in future to receive contracts for military aircraft they must move their factory at Meaulte, near Albert, farther from the frontier.

Professor F. A. Lindemann, formerly director of the Physical Department of the Royal Aircraft Factory at Farnborough, and Professor of Experimental Philosophy at Oxford since 1919, will contest the forthcoming University by-election.

It is contended by Professor Lindemann that a scientific method could be discovered to prevent enemy aeroplanes from crossing our shores. He gives, as one of the principal reasons for offering himself for election, his knowledge and experience in aeronautical matters.

TRIPLE ALLIANCE : A Miles Whitney Straight was used by Col. Lindbergh for his visit to Berlin last week. He is seen arriving at Staaken Aerodrome, where, with Mrs. Lindbergh, he was welcomed by Col. Kassner on behalf of General Goering, and by Herr Wolfgang von Gronau, president of the German Aero Club.

Eminent doctors attending the conference of the British Medical Association at Oxford last Wednesday week, witnessed the "bombing" of a Red Cross dressing station and the evacuation of casualties by the Monospar ambulance.

THE FLYING SQUAD : Mr. Tapper, of the A.A., used a Monospar S.T.25 to convey his "air scouts" from point to point during the Week-end Aérien, during which event they performed their usual efficient parking and other ground duties.

The first of the thirteen Boeing 299 four-engined bombers ordered by the U.S. Army Air Corps should be flying late in August or early in September. The remainder are scheduled to follow at the rate of one a month.

Seventy-seven single-seater fighters and parts equivalent to eight additional machines have been ordered by the U.S. Army Air Corps from the Seversky Aviation Corporation.

The engine of the new fighter is a two-row Pratt and Whitney driving a constant speed airscrew with manual control. This can be used as a sort of brake to prevent excessive speed in dives.

M. Mitchail Kaganovitch, head of the Russian aviation industry, says: "Our aeroplane factories are now bigger than any in Europe or America. We have no need to look to the West."

Twenty-five Years Ago

(From "Flight" of July 29, 1911)

"This apparaus, now being tested, is for automatically stabilising aeroplanes. The invention of M. Doutre, it consists of a compressed-air cylinder suitably coupled up so that it can operate the usual control organs automatically. It is itself controlled by the pressure of the relative wind on vanes in front of the apparatus."

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases, accompany letters intended for publication in these columns.

THE BOOKING ANOMALY

IN a leading article in *Flight* of July 23, commenting on Richard Carveth's article on airline booking difficulties in the same issue, you deal with a point to which I have for some time been giving some consideration. I often ask people, if they suddenly received a message from, say, the Isle of Wight, Scotland, or the Continent, requiring their urgent presence, how they would respond. Many tell me that they would go by air, and then I ask them how would they set about doing so, only to find, as I expected, that they have not the faintest idea beyond possibly "telephoning to Cooks."

I have discussed the matter with the people of one air route, who have explained to me what steps they take to try to educate the public, but it is all very expensive, and I feel sure that the "man in the street" really has not any idea how to get information about the various air services which are available, or how to obtain an air taxi.

Consequently it occurred to me that it would be a good thing if aeroplane clubs were to act as information bureaux and booking agents for all kinds of British air services, whether they are "tied" or not. The Coventry Aeroplane Club has taken to the suggestion, and I would be grateful if any operating air services concerned would send to me (a member of the committee of the above club) details, schedules and any other information which should prove helpful, and I will see that these are all sorted out and kept in proper order and that, when we have all the information, the Press in and around Coventry are notified that information on air travel can be obtained from the secretary of our club.

Having once got this working I will endeavour to persuade other aeroplane clubs to do the same in their districts. I understand that a club responsible for any bookings will receive a small commission, which is all to the good, as there is no aeroplane club in England which will turn down any source of revenue.

Finally, will those who are interested in pushing air travel kindly send particulars either to me (at Roslyn Chambers, Warwick Road, Coventry), or to the Honorary Secretary of the Coventry Aeroplane Club, Mr. P. Haselock, 25, Wainbody Avenue, Coventry, and we will do our best to help them.

Coventry. ERIC W. WALFORD.

THE OBVIOUS SOLUTION!

MR. CARVETH'S article "Peace or War" gave me great delight in that it put into words a thought that has long been in my mind. Some years, ago, when coach travel was at its height and at its worst, one of the biggest and strongest operators appointed agents wholesale along every new route. These agents did their utmost to build up traffic on these routes, often successfully. Then came a day when the big company thought its routes were sufficiently well known to support themselves. Many agents were cut out. Later all agents were cut out. The result was obvious. Where there was an alternative coach service the agents drove people to it. Where there wasn't, the agent drove his customer back to the railway—anywhere rather than to the operator who had let him down.

At that time I visualised a central coach agency whose activity would force the big company to accept its vouchers. It would then re-appoint the various sub-agents, thereby restoring their trade, though possibly at a reduced rate of commission.

British air transport is in an even more collapsible boat. The operators want agents—especially large ones; the agent wants operators—even obscure ones. But the Railway Clearing House won't have it.

Now, is there anything to stop the following plan from working? It is not so expensive as your contributor's "Air Bookings, Ltd.," but serves the same purpose.

A company would be formed by the airlines—called anything you like—say, the British Cold Mutton Co., Ltd. It would issue meat cards which would be accepted by the component operators as cash. These cards would be handed out in books to Cooks, etc.

The intending traveller turns up at Cooks and asks for a British airline ticket to Scandinavia. Cooks regret they are unable to book for the line, owing to the ban imposed by the Railway Clearing House, but if the gentleman would care to buy an appropriate amount of cards issued by the British Cold Mutton Co., Ltd., at the theatre counter over the way, they would be pleased to give him a free seat on the plane he desired by way of thanks. The British Cold Mutton Co., Ltd., would give Cooks the standard commission, or possibly slightly more as an encouragement, and the airlines would support the Mutton Co., which would not be very expensive, once they had paid me £1,000 for the idea!

The Cold Mutton Co., having given the cold shoulder to the Railway Clearing House, would force the latter to relax its grip on the agencies, and the British Cold Mutton Co., Ltd., would die a natural death, patting itself on the back for having achieved something in this perverse world.

Dunstable. D. H. RIDER.

STALLING OF TAPERED WINGS

THE recent attention which has been paid to the question of stalling of tapered wings has culminated in three very interesting sets of experiments. The first is by the N.A.C.A., the second is by Mr. Irving of the N.P.L., and the third by your contributor, Mr. W. E. Gray, working, apparently, on similar lines to Mr. Irving.

The N.A.C.A. scheme is to increase the maximum lift towards the tip by using the high camber, high lift sections. The only report seems to be in Prof. Klemin's account of the Langley Field Conference (*Aircraft Engineering*, U.S.A., July 1936). The method of increasing camber, alone, to increase lift also means added moment on the wing, which may be detrimental from a structural point of view. An alternative scheme, which I have previously suggested, is to move the point of maximum camber nearer the leading edge as the tip is approached. This has the desired effect of increasing K_L max. without the disadvantage of an increase in Km_0. If the camber is also increased, the increase in Km_0 is less than that due to camber only.

The results of Mr. Irving's experiments have been hinted at in *The Outlook* in *Flight* of July 9, and it is with interest that one awaits their publication.

Mr. Gray's first results are given in his article "Some remarkable stalling experiments," in *Flight* of July 16. [Further results appeared in last week's issue.—ED.] His full-scale tests were made by flying a wing in yaw. Since the spanwise distribution of lift on one half of a wing, in yaw, is affected by the distribution on the other, it does not follow that the results obtained by Mr. Gray apply to a tapered wing with varying amount of sweepback. In view of the results at zero yaw it appears that Mr. Gray's results do, at any rate, quantitatively, indicate what might be expected from a wing symmetrical in plan about the centre-line, but having a different sweepback from that of the Swallow.

These experiments would seem to suggest that all previous theories of wing stalling have been in error (Mr. Gray himself, of course, does not suggest or infer this). It seems more reasonable to me to say, rather, that they constitute additional factors which are not in contradiction to anything previously known. Otherwise it would mean that stalling properties are independent of wing section, etc. (The stalling of "straight" biplane wings without sweepback disproves this).

Accepting Mr. Gray's explanation of the phenomenon (i.e., that the air in the boundary layer flows from wing tip to root near the T.E. for negative sweepback), then for a yawed aerofoil there would appear to be a circulation introduced, in the plane of the wing, about the C.P. line perhaps (or that of maximum pressure on the upper surface of the wing). The direction of rotation of this circulation will be in the opposite sense to the yaw. This implies a side force on the wing, which is reasonable to expect. With a tapered wing (zero yaw) two circulations are set up working in opposite directions, in which case no side force is present.

The presence of these circulations means that the streamlines ahead of the wing will be deflected towards the normal to the C.P. line (or line of maximum pressure on upper surface of wing). The direction of this bending will be in the opposite sense to the flow observed at the T.E. of the wing.

Mr. Gray's apparatus, as he points out, is not sufficiently sensitive to show this, especially as he indicates his yaw by the direction of the local streamline about the point of maximum pressure on the upper surface.

Mr. Gray is to be congratulated on the amount of trouble he has taken in his investigations, and, as he points out, advance information should be useful to designers. One must remember, however, that "One swallow does not a summer make," and not jump to the premature conclusion that the trailing edge angle is the *only* important factor influencing wing stalling.

W. R. ANDREWS.

Manchester.

JUMPING to IT

New Autogiros Demonstrated in Wind and Rain : Steadiness in Gusty Air

The C.30 Autogiro with two-bladed rotor and autodynamic rotor head. The view on the left, showing the take-off, gives the impression that the machine is almost without visible means of support. On the right is seen a jump-start by the little Weir W.3. Mr. H. A. Marsh was the pilot on both occasions. (*Flight* photographs.)

TWO conclusions formed themselves in the minds of those who saw the first public demonstrations of the Autogiros with the new rotor heads over Hounslow Heath last Thursday: the direct take-off, or jump-start, has been solved in all its main principles; and the new rotor head has endowed the Autogiro with flying and landing qualities which it did not previously possess.

The day was not one which one would deliberately choose for demonstrating experimental machines, a strong and very gusty wind blowing across the Heath, with rain occasionally reducing visibility to almost nothing. Yet conditions were very suitable for giving convincing proof that the new development is by no means a fair-weather craft. In other respects, also, obstacles were put in the way of Mr. H. A. Marsh, who has done all the development flying in connection with the new rotor heads. The engine of the little Weir W.3 was not feeling very well, and as a result, the jump-start was not nearly as good as those made by the same machine at Abbotsinch aerodrome a fortnight ago, when *Flight* witnessed the tests and secured the photographs published last week. The engine fitted was the original experimental engine, which has already done much running, including all the "donkey work" in the initial tests of itself and of the new rotor head. The most it could be persuaded to do was to speed the rotor up to 330 r.p.m. instead of the 350 r.p.m. normally attained. In spite of this, however, Mr. Marsh got off safely, although the height reached in the jump was less than one-third of the best of which the machine is capable.

The C.30 with the new rotor head and two-bladed rotor did very well indeed. The machine weighed within 60 lb. of the normal all-up weight of the standard C.30, so that the demonstration was by way of being a full-load test. Yet the jump-start was entirely successful, and the machine was noticeably steady when flying in the very gusty air.

One feature of the combination of new rotor head and undercarriage was particularly interesting. The landing operation was quite distinctly divided into two stages. On the touch-down, the undercarriage legs telescoped but little at first; this corresponded to the period when the rotor itself was still air-borne while the rest of the aircraft had landed. Then the rotor brake was applied, and the machine "sank" a good deal more. This was due to one of the valuable features of the new rotor head. When the rotor brake is applied, the blades go into fine pitch, and all lift disappears; thus there is no tendency for the machine to be blown over, and there is no need to turn out of wind, as was the case with the older types.

Some of the visitors commented on a certain vibration of the whole machine while the rotor of the C.30 was being speeded up. Lest it should be thought that this is a necessary evil, it might be explained here that the vibration is due to a slight drawing office mistake having caused the clearance in the drive mechanism to be undesirably large. When a new head has been built, this vibration is likely to disappear completely. The new head was, it might be mentioned, designed and built in five weeks, as it was desired to ascertain as quickly as possible the soundness of the theory of the new head. The Mollart Company, incidentally, has carried out most of the work on both heads, and the same high-class workmanship which characterised the earlier heads is to be found in the new ones.

The principle of the autodynamic rotor head having been proved correct, it is now a matter of mechanical engineering to produce the simple, reliable rotor head needing a minimum of attention in service. One feels that the principle of the fluid flywheel could be applied with advantage to the rotor-starting mechanism, although doubtless a good deal of experimental development work would be needed to make it suitable.

Remarkable Diesel Claims

SOME remarkable results are claimed by a German inventor who has been carrying out extensive tests with an unconventional type of opposed-piston Diesel two-stroke. It is stated that the engine gives a 20 per cent. saving in fuel as compared with existing Diesels of similar power, that it is 40 per cent. lighter, and that it could be built at 40 per cent. lower cost. With small modifications the principle can also be applied to petrol engines.

The inventor, Ing. Schaefer, of Dusseldorf, is at present developing the engine for aeronautical use, and British patents are being taken out. His representative in this country is Mr. C. L. Rubens, 117, The White House, Albany Street, Regent's Park, London, N.W.1.

The boot on the other foot: Undergraduates of the London University signing for their Tutors.

The UNIVERSITY of LONDON SQUADRON

First Annual Camp at Halton as Climax to Inaugural Year's Training

By Major F. A. de V. Robertson, V.D.

Illustrated by "Flight" Photographs

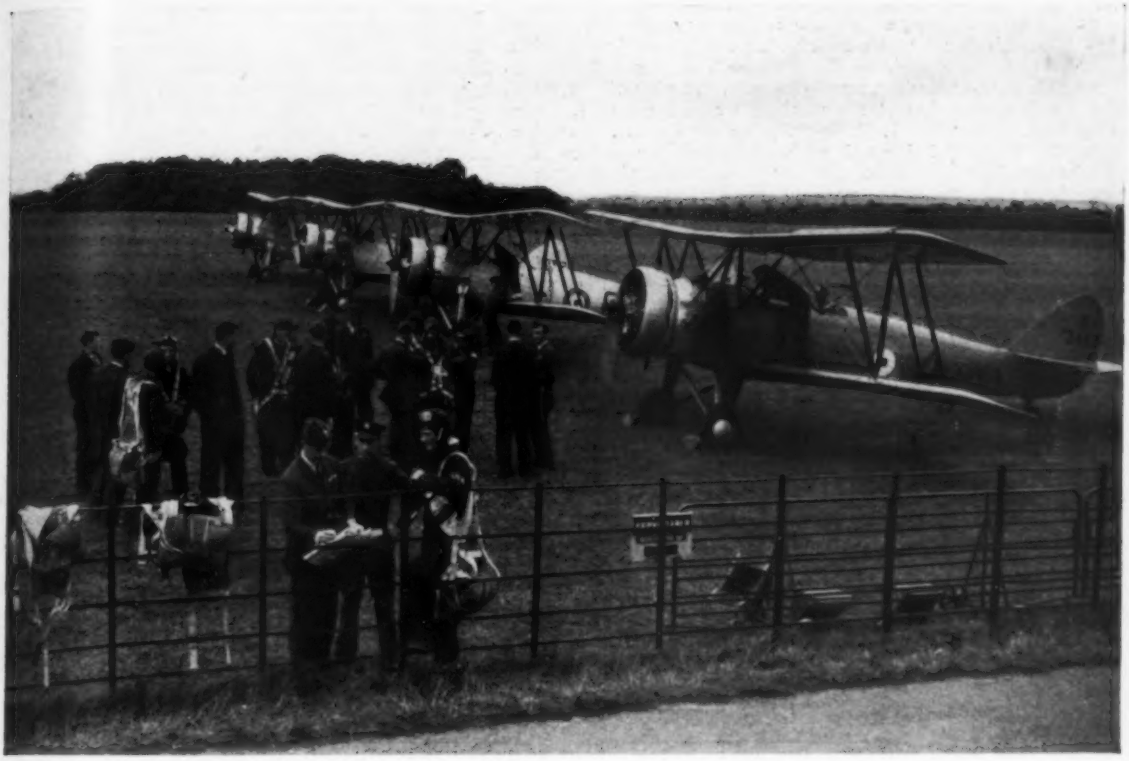
LAST winter *Flight* recorded the opening of the town headquarters of the University of London Air Squadron in Exhibition Road, Kensington, and now the first year of the squadron's work is being completed by a camp at Halton.

All the University air squadrons are now allowed to send their members up solo during term time, but as London is a non-residential University its air squadron would not in any case have been hampered by restrictions which can only be applied by residential Universities. Consequently a good deal of flying had been done at Northolt before the squadron went to camp, and good progress had been made. The camp puts the finish on the year's training, and with all members gathered together on the spot it is easy for the instructors to put a final polish on promising pupils.

For its first year this squadron was allowed to accept only twenty-five members, but next year it will be able to take fifty, and in the year after seventy-five. Actually twenty-three members went to camp, and lived in tents pitched closed to the officers' mess at Halton. Each bell tent was shared by two members, so that everything was comfortable, and there was no crowding. With them went the Chief Instructor, Wing Comdr. F. H. M. Maynard, A.F.C., who is himself a graduate of the University of London, the adjutant, Sqn. Ldr. D. Macfadyen, three permanent flying instructors, of whom Sqn. Ldr. Hamersley, M.C., is the chief, and two other flying instructors who were attached for the occasion. The squadron was equipped with twelve Avro Tutors, as well as two in reserve.

Before the end of the camp practically all the members had qualified to fly solo, and one actually qualified after only seven days of flying instruction. Most members take from ten to twelve hours of dual before they are judged fit to go solo, but of course the time varies. Some men take less than ten hours, and some take more. The length of time taken in dual instruction is not any criterion of what sort of pilot a man will be after he is fully trained and experienced. Some very brilliant pilots have been slow to learn in the early stages. After being passed as fit to go solo, a member is not turned loose to tour the heavens at his own sweet will. Dual instruction continues

Kipling's line, "Every blooming camping ground exactly like the last," does not apply to the charming spot where the tents of the U.L.A.S. are pitched. In the background is seen the officers' mess at Halton, once a country house of a wealthy Rothschild.



Ready for the afternoon's work. The Tutors are lined up and instructors and members are just going up for solo or dual flights.

to be given, and this is very necessary to prevent a pupil from developing faults.

The weather during this camp was worse than indifferent, and on two or more days flying was impossible. But the very most was made of the "fairer intervals," and practically all the soloists made some cross-country flights to not-too-distant aerodromes, such as Duxford, Northolt, and Abingdon. These flights were all carried out successfully. It was interesting to watch the members taking off and landing their Tutors. Halton is not too easy an aerodrome for inexperienced pilots, but they handled their machines with confidence, and gave plenty of evidence that the instruction had been good, and that they were apt pupils. Only one member had learnt to fly before joining the squadron, and he had obtained an "A" licence. During the year he has done about twelve hours' solo flying, but has been given a certain amount of dual as well.

During the camp the squadron was visited by Professor Bairstow, Zaharoff Professor of Aviation at the University of London, by Air Marshal Sir Frederick Bowhill, K.C.B., C.M.G., D.S.O., Air Member for Personnel on the Air Council, and by Sir Philip Sassoon, Under-Secretary of State for Air.

Starting the Squadron

It must have been a difficult matter for the Chief Instructor to start this squadron, for the University of London has more than twice as many students as the combined number of undergraduates at Oxford and Cambridge. That reckoning only includes the London men who are what is called internal students, men (and women) who are taking a recognised course at one of the Colleges of the University. There are also great numbers of external students who do not necessarily live in London and only sit for the examinations of the University. Only internal students are accepted for the squadron. Of course there were far more than twenty-five applications for membership, and the task of selection cannot have been easy. It is evident that the Chief Instructor has got together a body of men who are not only endowed with the right sort of intelligence for learning to fly quickly, but are also of the athletic type which everyone would wish to see in a University air squadron.

Two incidents during the camp showed the calm way in which members dealt with situations which called for in-

The men who made the Squadron. The Chief Instructor, Wing Commander F. H. M. Maynard, A.F.C. (right), who is an old Soccer "Purple" of London University, and the Adjutant, Sqn. Ldr. D. Macfadyen (left), who helps the C.O. to do everything for everybody.

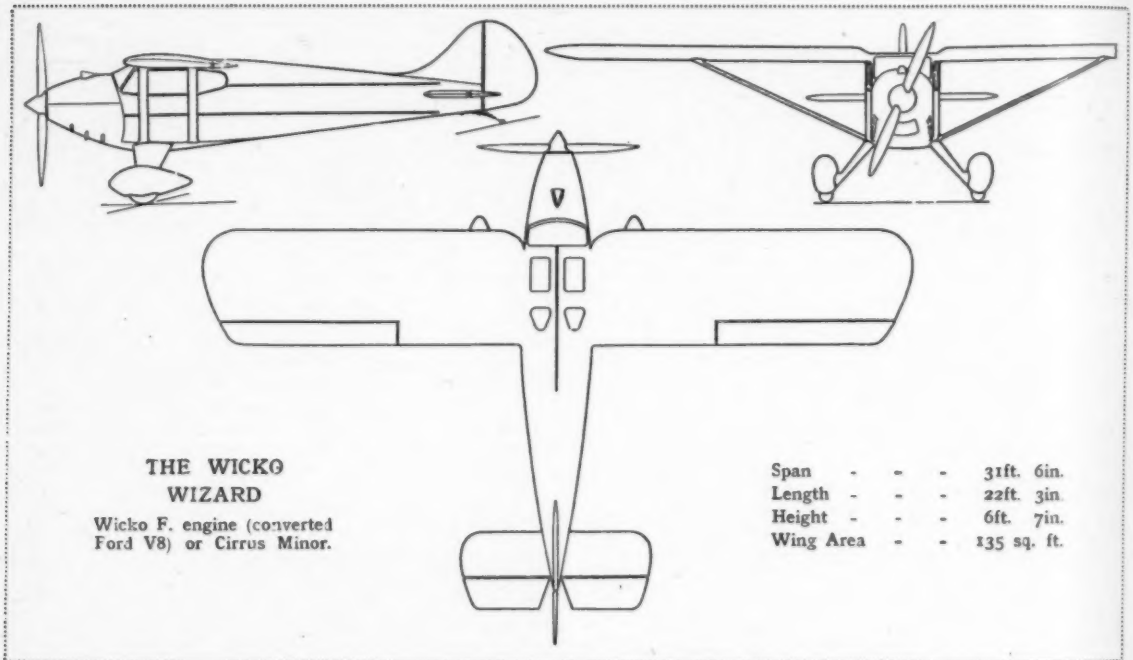
stantaneous decisions and prompt action. Quite early in the fortnight a two-seater from some other aerodrome flew over Halton, and a slight collision occurred in the air between the strange machine and one of the Tutors in which a member of the squadron was flying solo. A wing of the Tutor was damaged, and the machine was at no great height. The member, J. R. Quertier by name, did some quick thinking, and jumped with his parachute. He admits that he forgot to count "one, two, three," before pulling the ring, but he did everything else quite correctly, and landed safely on the aerodrome. The Tutor came down in a farmyard which a few minutes before had been full of men and sheep, but which luckily had just been emptied. It killed two fowls and reduced itself to "produce," but no other harm was done.

On the second occasion a member, flying solo, was practising stalled turns, when he "lost his prop." He quickly selected a field, and landed safely in it without doing any harm to his machine. The only unfortunate result was that he missed his lunch, for the forced landing happened just before 13.00 hours, and the member was ordered to stay by his machine until his instructor came out to him. No blame attached to either the pupil or the engine, but the former gained some useful experience which doubtless added to his confidence thereafter. It speaks well for the members of this squadron and for the instruction which they have received when on two occasions pupils with very little air experience can do the right thing in an emergency, and do it quickly.

The first year's work of the University of London Air Squadron shows promise of a very successful future for a most useful and interesting organisation.

NEW BRITISH CABIN TWO-SEATER

The Wicko Wizard, with Converted Ford V8 or Cirrus Minor : "Popular" Price : 120 m.p.h.



THE WICKO WIZARD

Wicko F. engine (converted Ford V8) or Cirrus Minor.

Span	-	-	31ft. 6in.
Length	-	-	22ft. 3in.
Height	-	-	6ft. 7in.
Wing Area	-	-	135 sq. ft.

MR. G. N. WIKNER may be recalled as the designer of the Wicko Wizard monoplane built in Australia in 1934 and illustrated in *Flight* on August 16 of that year. Now, with Mr. V. Foster, he is a partner of the Foster, Wikner Aircraft Co., of Lusty's Works, Colin St., Bromley by Bow, London, E.3, which company is constructing a new two-seater cabin monoplane to be marketed at a comparatively low figure.

Although it is laid out on strictly orthodox lines, the G.A. drawings show that the machine loses nothing in appearance. According to the designer, ease of control, stability and range of vision have been governing factors in the planning.

The wing is strut-braced and non-folding, and the tail plane a cantilever structure. A cantilever undercarringe is incorporated, the wheels being furnished with spats. In the cabin the two seats are mounted side-by-side and are adjustable fore and aft.

Normally the engine will be a converted Ford V8, known as the Wicko F. This model will be submitted for type tests at an early date. The reduction gear is a one-piece unit. Other modifications affect the ignition, water pump, generator and starter. Naturally the power/weight ratio compares unfavourably with specialised engines, but it is claimed that, for a machine of the nature of the new Wicko, this is comparatively unimportant.

With the Wicko F it is hoped to market the machine at a little under £400. The Cirrus Minor will be an alternative engine and the machine so powered will cost about £600. In this case a considerable increase in payload will follow. The main data are: Span, 31ft. 6in.; length, 22ft. 3in.; height, 6ft. 7in.; chord, 5ft.; wing area, 135 sq. ft.; weight, empty, 1,000lb.; gross weight, 1,500lb.; wing loading, 11lb./sq. ft.; power loading, 17.6lb./h.p.; top speed 120 m.p.h.; cruising speed, 100 m.p.h.; landing speed, 45 m.p.h.; cruising range, 250 miles.

"Flight" Index

THE index to *Flight* for January to June, 1936, is now ready, and copies are obtainable at 7d., post free, from the Flight Publishing Co., Ltd., Dorset House, Stamford Street, London, S.E.1. A binding case and index are obtainable for 4s. 4d., post free.

July 30, 1936 Supplement to FLIGHT 1364

The AIRCRAFT ENGINEER

"FLIGHT" ENGINEERING SECTION

No. 126 (Volume XIII No. 1) 11th Year July 30, 1936

THE AERODYNAMIC LOADS for STRESSING a WING

A Simplified Method : The Quarter Chord as Reference : Particular Advantages for Twisted Wings

By W. R. ANDREWS, A.F.R.Ae.S.

The method of the following article is based upon the conception of the quarter chord as reference, instead of C.P. The quarter chord remains fixed, whereas the C.P. does not, and thus provides a fixed basis on which to work. The author claims that greater accuracy is obtained by the methods outlined, especially in cases where large changes in weight and/or speed have to be investigated. The methods are particularly useful when investigating twisted wings, and Mr. Andrews, who is, of course, on the Technical Staff of A. V. Roe and Co., Ltd., estimates that such wings can be stressed in less than half the time provided the number of cases investigated is four or more, including a T.V. dive. Probably "old hands" will find some slight difficulty in forgetting their old friend the C.P., but it is thought they will quickly become accustomed to—and find a new friend in—the quarter chord.

THE usual method of splitting up the loads on a wing into the components of normal force, drag and torque does not readily allow the stresses for any particular case to be determined from a previously stressed one. This is because every new case involves a fresh C.P. position, at which the lift is applied, and the moment about the flexural line must be determined by integration. No simple relationship exists between flexural line and all C.P. positions, except in isolated cases.

The Flexural Line

The flexural line is defined as that line along the wing at which the distributed loading must be applied so that only flexural distortion is produced. That is to say, the incidence of each section remains unaltered as the load is applied. For the case of a single concentrated load without any distributed load superimposed, a flexural line does not exist. A concentrated load together with a distributed load requires a flexural line with a discontinuity at the point of application of a single load.

The torsional deflection due to a concentrated load is dependent upon the stiffness of the wing outboard of the point of application as well as that of the inboard portion. It follows that to stress such a wing rigorously must be very involved and to bring the computations within practical limits many approximate and simplifying assumptions must be made.

In the present stressing procedure, no allowance is made for the effect of the wing-twist upon the aerodynamic loading along the span, which for a flexible wing can be very appreciable. This twisting of the wing is a cumulative effect, since the more the twist the greater the variation of loading along the span, which always tends to increase the twist until a state of balance is obtained.

In view of the uncertainty as to the method of stressing a wing for a concentrated load, it is not thought that the accuracy will be greatly diminished if the stresses due to it are determined independently and added to those due to the aerodynamic loading. The method of this article is evolved on that assumption. In any case, it is doubtful if the loss of accuracy is as great as neglecting the variation of load due to wing-twist.

Although a point may be found at any section where an applied load causes no twist with respect to some other section, the front and rear spars at that section may not have the same relative slope as for the unloaded wing. In other words, the point of application of the load depends upon the choice of reference section, except for the case where I_F/I_R and E are constant along the span. This explanation is necessary since in some quarters the flexural line is referred to as the locus of the point at which a concentrated load is applied to give no twist between the section considered and the wing root. The latter line is

the one more easily determined from loading tests on a wing, and if the ratio of I_F/I_R and E remain sensibly constant along the span the line so found will approximate to the flexural line.

The integration necessary for determining the flexural line, for a two-spar wing, is as follows :—(Ref. 1.).

$$wr = Zw + 2\left(\frac{dz}{dx}\right)\int_1^x w\,dx + \left(\frac{d^2z}{dx^2}\right)\int_1^x\int_1^x w\,(dx)^2 \quad .. \quad (1)$$

where w = loading per unit span.
r = distance of flexural axis from rear spar in terms of distance between the spars.
x = distance out from root.
$Z = \dfrac{I_R \cos 3\alpha F}{I_R \cos 3\alpha R + I_F \cos 3\alpha F}$
1 = Semi span.
α_F & α_R = Angle of front and rear spar to C.L. of wing in plan.

It will be noticed that this integration is carried out from the tip inwards.

Point of Application of Aerodynamic Loading

Due to the more general use of the C.P. for the stressing of a wing, it is impossible to use the stresses from one case and easily determine those for another. The following method, although somewhat more refined in certain respects than may be found necessary in practice, provides a means of obtaining quickly and accurately the stresses for all other cases from those found for one case. The method is to apply certain unit loads in the manner laid down and calculate the stresses induced by these loads by standard methods. The stresses in the particular cases are then obtained by proportion and addition. Another great advantage of the method lies in the ease with which major modifications (changes of speed and weight) can be allowed for accurately. Where the stressing cases are few the method offers little advantage, but so far as British requirements are concerned the number of stressing cases cannot usually be considered as few.

The only way of accomplishing the end in view is to replace the C.P. position by some fixed line about which the moment is known. The only line which satisfies the requirements of simplicity is that about which the moment coefficient is constant. Usually this line is referred to as the " Quarter Chord," but from empirical data the following relationship is obtained.

$$dKm/dK_L = e = .25 - .4\,t^2 \quad .. \quad .. \quad .. \quad (2)$$

where t = maximum thickness — chord ratio of the aerofoil section.

As difficulty is sometimes experienced in changing over from the conception of C.P. to that of a constant moment coefficient about the quarter chord, the following notes may help.

Consider only the approximate relationship for C.P.

$$\text{C.P.} = \frac{-Km}{K_L} \quad .. \quad .. \quad .. \quad .. \quad .. \quad (3)$$

where C.P. is in terms of chord.

It can be shown on empirical evidence that the $Km - K_L$ curve is invariably a straight continuous line from no-lift to very near K_L max. so that we may write

$$Km = -eK_L + Km_0 \quad .. \quad .. \quad .. \quad .. \quad (4)$$

where Km_0 is the no-lift moment.

The C.P. expression then becomes

$$\text{C.P.} = e - \frac{Km_0}{K_L} \quad .. \quad .. \quad .. \quad .. \quad .. \quad (5)$$

This is still with respect to the L.E.

If now we take moments about the C.P. position on the chord we get the moment about *ec* as :—

$$Km(ec) = K_L(\text{C.P.} - e) = -K_L\frac{(Km_0)}{K_L} = -Km_0$$

by substitution from Equation 5.

This leads us to a fixed line on the wing about which the moment coefficient is constant and at which the lift is applied.

The Untwisted Wing

For the aerodynamically untwisted wing the load coefficients about the flexural line can be split up as follows :—

(*a*) Km_0 transferred directly from *ec*.
(*b*) $\triangle Km$ due to transferring K_L from *ec* to flexural line.
(*c*) The lift K_L applied at the flexural line.
(*d*) The drag.

Let f.c. be the distance, at any point, from the " quarter chord " to the flexural line. Assuming the normal force coefficient to be equal to K_L (as is customary) then the total moment on the wing at any section is

$$-M = \rho\sigma V^2\int_1^x Km_0 C^2\,dx + \rho\sigma V^2\int_1^x f\,K_L\,C^2 dx \quad .. \quad (6)$$

The first part of the right-hand expression is independent of the span wise loading and remains constant (except for V) for all the cases.

Since for an untwisted wing it is customary to use the same loading distribution curve for all values of lift we may write

$$\rho V^2\,\sigma\,\overline{K_L}\int_1^x f\frac{K_L}{\overline{K_L}}C^2\,dx$$

for the second part of the right-hand side of equation 6 where $\overline{K_L}$ is the mean lift coefficient. The integral is then a constant for all values of K_L and finally

$$-M = \rho\sigma V^2\left[\int_1^x Km_0\,C^2\,dx + \overline{K_L}\int_1^x f\frac{K_L}{\overline{K_L}}C^2\,dx\right] \quad (7)$$

A special case arises where the C.P.B. has the overriding value of C.P.F. + .1. In this case the Km_0 must be artificially increased to :—

$$Km_0' = (1 - K_L)\,Km_0 + \frac{K_{Lm}\,K_L}{10}$$

The loads due to Km_0 alone must then be increased in the ratio $\dfrac{Km_0'}{Km_0} = (1 - K_L) + \dfrac{K_{Lm}\,K_L}{10 \cdot Km_0}$

The shear and B.M. for the front and rear spars can then be expressed as follows :—

For Front Spar.

$$\textit{Shear} \quad -E_F\,I_F\frac{dy_f}{dx_f} = \rho\sigma V^2\,\overline{K_L}\int_{1f}^{xf}\left(\frac{K_L C}{\overline{K_L}}\right)r\cos\alpha f\,dx_f$$

$$\text{B.M.} \quad E_F\,I_F\frac{d^2y_f}{dx^2{}_f} = \rho\sigma V^2\,\overline{K_L}\int_{1f}^{xf}\int_{1f}^{xf}\left(\frac{K_L C}{\overline{K_L}}\right)r\cos\alpha f(dx_f)^2$$

Similarly for the Rear Spar.

$$\textit{Shear} \quad -E_R\,I_R\frac{dy_R}{dx_r} = \rho\sigma V^2\,\overline{K_L}\int_{1r}^{xr}\left(\frac{K_L C}{\overline{K_L}}\right)(1-r)\cos\alpha_R\,dx_R$$

$$\text{B.M.} \quad E_R\,I_R\frac{d^2y_R}{dx^2{}_R} = \rho\sigma V^2\,\overline{K_L}\int_{1r}^{xr}\int_{1r}^{xr}\left(\frac{K_L C}{\overline{K_L}}\right)(1-r)\cos\alpha_R(dx_R)^2 \quad .. \quad .. \quad .. \quad .. \quad (8)$$

The spar stresses due to direct and differential bending can be expressed in terms of $\overline{K_L}\rho\sigma V^2$ and $Km_0\rho\sigma V^2$ only.

This article is not concerned with the determination of absolute stresses due to bending and torsion. The stressing has been taken only as far as is necessary to show that a particular case can be obtained from a general case in unit loadings. The final stresses in the member can be expressed as follows :—

$$\text{Stress} = A\rho\sigma V^2 + B\overline{K_L}\rho\sigma V^2 + GK_D\rho\sigma V^2$$

Where $\sqrt{\sigma}V$ is I.A.S. (*fps*) and $\rho = .002378$.

If the wing loading is w, and $\overline{K_L} = \dfrac{w}{\rho\sigma V^2}$

then for straight flying (i.e. without gusts)

$$\text{Stress} = A\rho\sigma V^2 + Bw, + GK_D\rho\sigma V^2 \quad .. \quad .. \quad (9)$$

Where A, B and G vary along the span, A depends upon Km_0 and B depends upon the sum of the stresses induced by differential bending through moving point of application of K_L from the quarter chord to the flexural line, plus

the direct stress due to $K_{\bar{L}}$, the term involving K_D is discussed later.

For the T.V. Dive case the appropriate value of wing loading w, is equal to — Tail load/wing area and for the gust cases of 25 f.p.s. true speed the equivalent wing loading is :—

$$w_g = w, \pm 57.3 \times 25\, \sigma^{3/2} \rho V \frac{dK_L}{dx}$$

where dK_L/dx is the change of K_L per degree

$$= w, \pm 3.405\, \sigma^{3/2} V \frac{dK_L}{dx} \quad .. \quad .. \quad .. \quad .. \quad (10)$$

where σ = relative density at height.

An examination of Equation 9 shows immediately that since A, B and G are constants the stress due to a change in speed or gross weight can easily be determined without carrying out any integrations, the component stresses being obtained by proportion.

If many cases are to be considered together, that part of Equation 9 dealing with the drag can be again split up into the effect of profile and induced drags. This is more accurate than the usual method of considering the drag as equally distributed along the span In view of the many assumptions made in the stressing of monoplane wings this refinement may not be considered justified, but to make the investigation as full as possible the process is included. The drag coefficient at any point along the wing can be expressed approximately as

$$K_D = K^2_L \left(\frac{1}{a_L} - \frac{1}{a_0}\right) \frac{1}{57.3} + K_{D_p} \quad .. \quad .. \quad (11)$$

where a_0 = dK_L/dx for infinite aspect ratio (per degree)
a_L = $\dfrac{dK_L}{dx}$ locally at the considered section.

K_{D_p} = Profile drag coefficient.

If an average value is given to K_{D_p} for the low incidence cases (i.e. T.V. dive, gust, and C.P.B. cases) the loads due to K_{D_p} can be obtained readily by the usual procedure. For the C.P.F. cases it is assumed that the distribution of K_{D_p} is a constant function of that for the low incidence cases; here again no difficulty is experienced in finding the stresses.

The usual method of finding the load-grading curve is in terms of $K_L C/C_0$ at 1 radian from no-lift so that from its local value it follows that

$$K_{D_i} = K^2_L \left(\frac{C}{w_2 C_0} - \frac{1}{57.3 a_0}\right)$$

where a_0 is the change in K_L per degree.
$w_2 = K_L C/C_0$ at 1 radian from no-lift.

Now integrate the loading curve and find

$$\overline{K}_L \frac{Sw}{2} = -C_0 \int_1^0 K_L \frac{C}{C_0} dx = C_0 \int_0^1 w_2 dx$$

where Sw = wing area.

It follows then that at 1 radian from no-lift the overall induced drag coefficient is given by

$$\overline{K}_{D_i} \frac{Sw}{2} = K \overline{K}_L{}^2 \frac{Sw}{2} = -C_0 \int_1^0 \left(\frac{C}{C_0 w_2} - \frac{1}{57.3 a_0}\right) K_L{}^2 \frac{C}{C_0} dx$$

$$= -C_0 \int_1^0 \left(\frac{1}{w_2} - \frac{C_0}{57.3 C a_0}\right) w_2{}^2 dx \quad .. \quad .. \quad (12)$$

At 1 radian from no-lift

K_{L_L} = local value of the lift coefficient.

The local value of the induced drag coefficient at incidences other than 1 radian from no-lift is then given by ;—

$$K_{D_{i_L}} = K_{D_{i_L}} \text{ (at 1 rad.)} \left(\frac{\overline{K}_L}{57.3\, \bar{a}}\right)^2 \quad .. \quad .. \quad (13)$$

$\bar{a}$ = overall value of $\dfrac{dK_L}{dx}$ for wing.

The tangential force coefficient is given by

$K_T = K_D \cos\alpha - K_L \sin\alpha + K_{D_p} \cos\alpha$

which for the low incidence cases can be approximated to by

$$K_T \doteq K_{D_i} - \frac{K_L}{57.3} + K_{D_p}$$

$$= K_{D_i} - \frac{K_L{}^2}{57.3a} + K_{D_p}$$

so that since $K_{D_i} = kK_L{}^2$

$$K_T = K_L{}^2 \left(k - \frac{1}{57.3a}\right) + K_{D_p} \quad .. \quad (14)$$

$$\overline{K}_{T_i} \int_1^x C dx = \left(\frac{\overline{K}_L}{57.3a}\right)^2 C_0 \int_1^x \left(w_2 \frac{C}{C_0} - \frac{1}{57.3 a_0} - \frac{1}{57.3a}\right)$$

$$K_L{}^2 \frac{C}{C_0} dx + C_0 \int_1^x \frac{C}{C_0} K_{D_p} dx$$

$$= \left(\frac{\overline{K}_L}{57.3a}\right)^2 C_0 \int_1^x 1 - \frac{w_2 C_0}{57.3C} \left(\frac{1}{a_0} + \frac{1}{a}\right) w_2 dx + C_0 \int_1^x \frac{C}{C_0} K_{D_p} dx$$

.. .. (15)

Both the above integrals are constants and the end loads in the spars are easily calculated in the usual manner.

Relief Due to Wing Weight

It has been customary to subtract from the gross weight of the aeroplane the weight of the wings and use this figure for stressing the wings themselves. This procedure implies that the weight of the wing is proportional to the wing loading. With a tapered wing, cantilever monoplane, the wing loading per unit area increases towards the tip. The relief due to taking net lift for stressing tends to underestimate the bending moments at the root, since although the wing weight per unit area decreases towards the tip, the aerodynamic loading increases. Fig. 1 shows how the loading and weight of a tapered cantilever wing may vary (for a tip chord equal to half the root chord). The total shear and bending moment on the wing are also shown and for a two-spar system it will be usually sufficiently accurate to distribute the relief equally between the spars unless a detailed estimate of the C.G. locus is available for a similar type of wing. The above remarks of course do not apply to steep dive cases where the wing weight tends to give tangential instead of normal forces.

The Twisted Wing

The lift at any section for a twisted wing can be expressed as

$$K_{L_L} C = (a_L \alpha + b_L) C \quad .. \quad .. \quad .. \quad .. \quad (16)$$

Where K_{L_L} is the local value of K_L

a_L = local value of the slope of the lift curve
α = Incidence of root (or reference section).
b_L = Local increase of K_L above that for an untwisted wing at the same root incidence.

The first part of the right-hand side of the equation (viz. $a_L \alpha C$) is the loading for an untwisted wing at the same root incidence and the second portion $b_L C$ is a constant at all angles of incidence.

It has been customary to determine the local K_L and C.P. positions for each stressing case, the twisting and bending moments being obtained by integration of the moments about the flexural line. This procedure is usually very lengthy and somewhat cumbersome and the following alternative is suggested.

By finding two flexural lines—one for the loading $b_L C$ and the other for $a_L \alpha C$, the wing can be treated as an untwisted wing plus a constant BM shear and torque due to $b_L C$. This method has the added advantage that if at any time the twist is altered the revised stresses are quickly arrived at without the necessity of recalculating for each case the lift, C.P. position and the flexural axis. This is so since the flexural line is a function of the shape of the loading curve only and is not dependent upon the absolute value of the loading. Provided the shape of the twist distribution curve remains unaltered the stresses due to the constant $b_L c$ are increased in the same ratio as the twist.

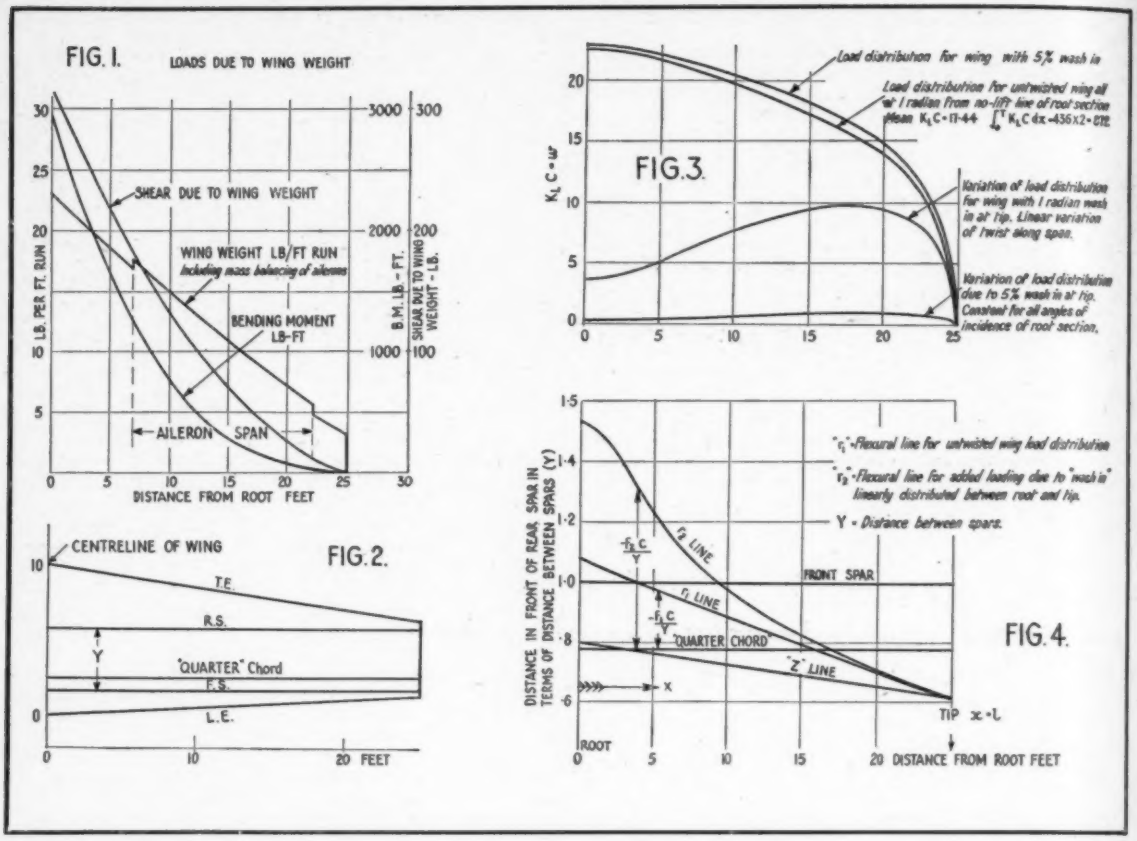


FIG. 1.
LOADS DUE TO WING WEIGHT
SHEAR DUE TO WING WEIGHT
WING WEIGHT LB/FT RUN
Including mass balancing of ailerons
BENDING MOMENT LB-FT
AILERON SPAN
LB. PER FT. RUN
B.M. LB. - FT.
SHEAR DUE TO WING WEIGHT - LB.
DISTANCE FROM ROOT FEET
FIG. 2.
CENTRELINE OF WING
T.E.
R.S.
"QUARTER" Chord
F.S.
L.E.
FEET
FIG. 3.
Load distribution for wing with 5° wash in
Load distribution for untwisted wing all at 1 radian from no-lift line of root section
Variation of load distribution for wing with 1 radian wash in at tip. Linear variation of twist along span.
Variation of load distribution due to 5° wash in at tip. Constant for all angles of incidence of root section.
FIG. 4.
"r1"-Flexural line for untwisted wing load distribution
"r2"-Flexural line for added loading due to "wash in" linearly distributed between root and tip.
Y - Distance between spars.
r2 LINE
r1 LINE
FRONT SPAR
"QUARTER CHORD"
"Z" LINE
TIP x = L
ROOT
DISTANCE IN FRONT OF REAR SPAR IN TERMS OF DISTANCE BETWEEN SPARS (Y)
DISTANCE FROM ROOT FEET

As an example the B.M., torque and shear for a simple twisted wing have been calculated to show the relative simplicity of the method.

Worked Example (Twisted Wing)

The general particulars of the hypothetical wing chosen are as follows :—

Span	..	..	50 feet
Root Chord	..	..	10 ,,
Tip Chord	..	..	5 feet
Wash-in at tip	..	..	5°
Wing Area	..	..	375 sq. feet.

(See Fig. 2.).

The wash-in is distributed linearly along the span and the spars are parallel in plan.

The aspect ratio is 6.67, but the span-wise distribution of load (Fig. 3) is determined from the curves of A.P. 970 at an aspect ratio A = 2 a_0 which for a value of a_0 (per

TABLE 1.

CALCULATION OF FLEXURAL LINE DUE TO LOADING FOR UNTWISTED WING.

x Feet	Z	w_1	$-\int_l^x w_1 dx$	$\frac{2}{w_1}\cdot\frac{dZ}{dx}\int_l^x w_1 dx$	r_1
Tip 25	0.62	0	0	0	0.620
24	0.627	7.25	5.0	0.010	0.637
22	0.642	11.6	24.2	0.030	0.672
20	0.656	14.0	50.0	0.051	0.707
18	0.670	15.5	79.4	0.074	0.744
16	0.685	16.7	102.6	0.089	0.774
14	0.699	17.8	138.1	0.112	0.811
12	0.714	18.8	174.7	0.134	0.848
10	0.728	19.75	213.3	0.155	0.883
8	0.743	20.6	253.7	0.177	0.920
6	0.758	21.35	295.5	0.199	0.957
4	0.771	22.0	338.9	0.216	0.987
2	0.786	22.4	383.3	0.246	1.032
0	0.800	22.6	428.1	0.273	1.073

$$-2\frac{dz}{dx} = .0144.$$

TABLE 2.

CALCULATION OF FLEXURAL LINE DUE TO VARIATION OF LOADING WITH LINEAR DISTRIBUTION OF WASH IN FROM ROOT TO TIP.

x Feet	Z	w_2 1. Rad. at Tip.	$-\int_l^x w_2 dx$	$\frac{2dZ}{w_2 dx}\int_l^x w_2 dx$	r_2
Tip 25	0.620	0	0	0	0.620
24	0.627	5.76	4.2	0.010	0.637
22	0.642	8.5	19.0	0.032	0.674
20	0.656	9.4	37.0	0.057	0.713
18	0.670	9.7	56.3	0.083	0.753
16	0.685	9.6	75.6	0.113	0.798
14	0.699	9.2	94.4	0.148	0.847
12	0.714	8.6	112.2	0.188	0.902
10	0.728	7.75	128.6	0.239	0.967
8	0.743	6.75	143.2	0.306	1.049
6	0.758	5.6	155.6	0.400	1.158
4	0.771	4.5	165.6	0.530	1.301
2	0.786	3.75	173.9	0.668	1.454
0	0.800	3.6	181.3	0.727	1.527

TABLE 3.

CALCULATION OF DIRECT SHEAR AND BENDING MOMENT ON THE FRONT SPAR CONTRIBUTED BY THE LOADING FOR AN UNTWISTED WING APPLIED ALONG THE FLEXURAL LINE (r_1).

x Feet	r_1	w_1	$w_1 r_1$	$-\int_l^x \frac{w_1 r_1 dx}{\overline{K}_{L_0}}$	$\int_l^x \int_l^x \frac{w_1 r_1 (dx)^2}{\overline{K}_{L_0}}$
Tip 25	0.620	0	0	0	0
24	0.637	7.25	4.62	2.31	1.6
22	0.672	11.6	7.79	14.94	18.0
20	0.707	14.0	9.90	32.76	65.2
18	0.744	15.5	11.54	54.20	152.2
16	0.774	16.7	12.93	78.67	285.0
14	0.811	17.8	14.43	106.0	469.7
12	0.848	18.8	15.95	136.4	712.0
10	0.883	19.75	17.43	169.8	1018
8	0.920	20.6	18.94	206.2	1394
6	0.957	21.35	20.46	245.6	1846
4	0.987	22.0	21.70	287.7	2369
2	1.032	22.4	23.12	332.5	2990
0	1.073	22.6	24.25	379.9	3602

$$\frac{Shear}{q} = \frac{-\overline{K}_L}{\overline{K}_{L_0}} \int_l^x w_1 r_1 dx \; ; \; \frac{B.M.}{q} = \frac{\overline{K}_L}{\overline{K}_{L_0}} \int_l^x \int_l^x w_1 r_1 (dx)^2 \; ;$$

$\overline{K}_{L_0} = 2.865$.

TABLE 4.

CALCULATION OF DIRECT SHEAR AND BENDING MOMENT ON THE FRONT SPAR DUE TO ADDED LOADING WITH 5° WASH IN AT TIP. LOADING APPLIED AT FLEXURAL LINE r_2.

x Feet	r_2	w_2 5° wash in	$w_2 r_2$	$-\int_l^x w_2 r_2 dx$	$\int_l^x \int_l^x w_2 r_2 (dx)^2$
Tip 25	0.620	0	0	0	0
24	0.637	0.50	0.319	0.160	.08
22	0.674	0.742	0.500	1.002	1.197
20	0.713	0.819	0.584	2.094	4.27
18	0.753	0.846	0.637	3.32	9.69
16	0.798	0.837	0.668	4.62	17.62
14	0.847	0.802	0.678	5.97	28.21
12	0.902	0.750	0.677	7.32	41.50
10	0.967	0.676	0.653	8.64	57.46
8	1.049	0.588	0.617	9.91	76.01
6	1.158	0.498	0.577	11.11	96.03
4	1.301	0.393	0.472	12.15	119.3
2	1.454	0.327	0.476	13.10	144.5
0	1.527	0.314	0.480	14.06	171.7

$$\frac{\text{Shear}}{q} = -\int_l^x w_2 r_2 dx \; ; \; \frac{\text{Bending Moment}}{q} = \int_l^x \int_l^x w_2 r_2 (dx)^2 .$$

TABLE 5.

CALCULATION OF MOMENT ON WING DUE TO APPLYING LOADING FOR UNTWISTED WING AT FLEXURAL LINE r_1 INSTEAD OF AT THE "QUARTER CHORD."

x Feet	$f_1 c$ Feet	w_1	$w_1 f_1 c$	$\frac{M}{q} \frac{\overline{K}_{L_0}}{\overline{K}_L}$	$\frac{M}{q \overline{K}_L}$
Tip 25	0.666	0	0	0	0
24	0.495	7.25	3.59	1.79	0.63
22	0.450	11.6	5.22	11.35	3.96
20	0.304	14.0	4.25	21.00	7.33
18	0.150	15.5	2.33	27.58	9.62
16	0.013	16.7	0.21	30.12	10.52
14	−0.129	17.8	− 2.30	30.10	10.51
12	−0.283	18.8	− 5.33	24.54	8.57
10	−0.429	19.75	− 8.47	10.74	3.75
8	−0.582	20.6	−11.98	− 9.71	− 3.39
6	−0.737	21.35	−15.74	− 37.43	−13.06
4	−0.861	22.0	−18.95	− 72.12	−25.2
2	−1.050	22.4	−23.50	−114.6	−40.0
0	−1.230	22.6	−27.75	−165.8	−57.9

NOTES.—$q = \rho \sigma V^2$; $\frac{M}{q} = \frac{-K_L}{\overline{K}_{L_0}} \int_l^x C.w_1 f_1 dx$; $\overline{K}_{L_0} = K_L$ at 1 rad. from no-lift for $A = 2a_0$ (per rad.) at which aspect ratio curves of A.P. 970 are calculated $= 2.865$.

TABLE 6.

CALCULATION OF MOMENT PRODUCED BY THE NO-LIFT MOMENT PLUS THAT DUE TO MOVING POINT OF APPLICATION OF ADDED LOADING WITH 5° TWIST FROM 0.25C TO FLEXURAL LINE r_2.

x Feet	$f_2 C$ Feet	w_2 5° at tip	$f_2 w_2 C$	$Km_0 C$	$(f_2 w_2 + Km_0)C$	$\frac{M}{q}$
25	0.666	0	0	−0.103	−0.10	0
24	0.495	0.50	0.247	−0.104	+0.143	0.02
22	0.442	0.742	0.328	−0.112	0.216	0.435
20	0.279	0.819	0.229	−0.120	0.109	0.867
18	0.121	0.846	0.102	−0.128	−0.026	0.950
16	−0.079	0.837	−0.066	−0.136	−0.202	0.722
14	−0.279	0.802	−0.223	−0.144	−0.367	0.153
12	−0.508	0.750	−0.381	−0.152	−0.533	− 0.747
10	−0.780	0.676	−0.527	−0.160	−0.687	− 1.967
8	−1.120	0.588	−0.658	−0.168	−0.826	− 3.480
6	−1.575	0.498	−0.780	−0.176	−0.956	− 5.262
4	−2.170	0.393	−0.852	−0.184	−1.036	− 7.254
2	−2.810	0.327	−0.919	−0.192	−1.111	− 9.401
0	−3.110	0.314	−0.977	−0.200	−1.177	−11.689

$$\frac{M}{q} = -\int_l^x (f_2 w_2 + Km_0) C \, dx \; ; \; Km_0 = -0.02.$$

radian) of 2.86 the aspect ratio is 5.74. As, however, the shape of the load distribution is not appreciably affected by small changes in aspect ratio the curves of A.P. 970 are applied without correction. Serious error might be introduced by adopting this procedure if the loads in members are expressed in terms of the angle from no-lift instead of the mean K_L. This error is caused by the change in the slope of the lift curve for the actual wing being different from that for the wing of aspect ratio $2 a_0$ upon which the load distribution is based.

The position of the spars assumed is shown in Fig. 2 and the calculation of the flexural lines is carried out as shown in Tables 1 and 2, the results being plotted in Fig. 4. It will be noticed that for ease of computation equation 1 is divided through by w giving

$$r = Z + \frac{2}{w} \frac{dz}{dx} \int_1^x w \, dx \quad .. \quad .. \quad .. \quad .. \quad (17)$$

Since the Z line is assumed to be straight $\frac{d^2z}{dx^2}$ is zero and the second differential vanishes. Where possible it is a great advantage to approximate to the Z line by a series of straight lines as suggested by Mr. Horne (Ref. 3) and use equation 17 in preference to 1. The correction for the discontinuity due to Mr. Burton where the straight line approximations meet is also given in Ref. 3.

The direct shears and bending moments on the spars due to the loading for an untwisted wing follow automatically in Table 3 and for the added load with twist in Table 4. These have been calculated for the front spar only. The loads due to the untwisted wing at any value of $\overline{K}_L$ are obtained directly by proportion (Fig. 5) and are then added to the constant loads induced by the twist on the wing (Fig. 6).

The overall moment calculation proceeds as in Tables 5

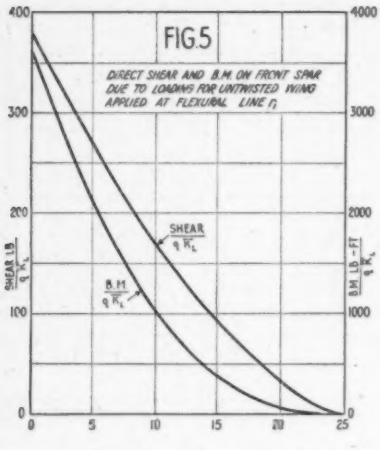


FIG.5
DIRECT SHEAR AND B.M. ON FRONT SPAR DUE TO LOADING FOR UNTWISTED WING APPLIED AT FLEXURAL LINE r_1
SHEAR / $q K_L$
B.M / $q K_L$
SHEAR LB / $q K_L$
B.M LB-FT / $q K_L$

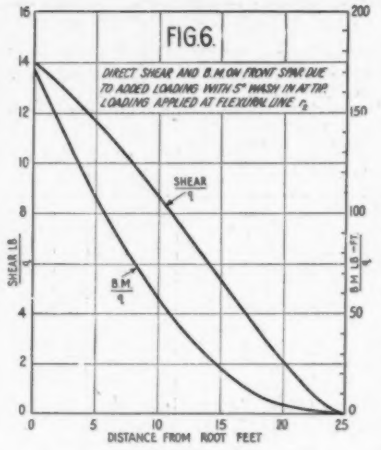
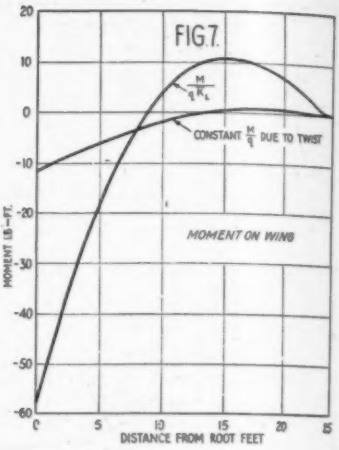


FIG.6.
DIRECT SHEAR AND B.M ON FRONT SPAR DUE TO ADDED LOADING WITH 5° WASH IN AT TIP. LOADING APPLIED AT FLEXURAL LINE r_2
SHEAR / q
B.M / q
SHEAR LB / q
B.M LB-FT / q
DISTANCE FROM ROOT FEET



and 6, the results being plotted in Fig. 7. The spar loads due to differential bending follow the same laws as the moment, but their computation is beyond the scope of the present article which is confined, as far as possible, to aerodynamic loadings only.

REFERENCES.

1. Problems involving the stiffness of Aeroplane Wings. Roxbee Cox Ph.D., etc. *Journal Royal Aeronautical Society*, February, 1934.
2. The Design of Aerofoils, and the Prediction of Characteristics. W. R. Andrews, A.F.R.Ae.S. *Aircraft Engineer*, Oct., Nov., Dec., 1933.
3. The Stressing of Monoplane Wings. H. N. Horne. *Aircraft Engineer*, March, 1936.

TORSION on MULTI-CELL SECTION

LACK of time to submit proofs to the author before publication resulted in some errors in the article by J. Lobley on Torsion on a Multi-Cell Section with Thin Walls, published in *The Aircraft Engineer* of June 18, 1936. Throughout the article "ϕ" should read "$\oint$" (integral round the section), and for "c" should be substituted "C."

In line 40 of the second column on p. 42 ". . . and S is the perimeter of the section" should read ". . . and s is the perimeter of the section."

On the same page, line 44, col. 2, "$\theta = \ldots \frac{1}{2S} \phi q/cds$" should read "$\theta = \ldots \frac{1}{2S} \oint \frac{qds}{C}$."

Similarly, equation (3) should be:

$$\theta = \frac{1}{2S_A} \oint \left(\frac{qds}{C}\right)_A = \frac{1}{2S_B} \oint \left(\frac{qds}{C}\right)_B = \text{etc.}$$

TECHNICAL LITERATURE

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS

REPORTS published by His Majesty's Stationery Office, London, which may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C.2; 120, George Street, Edinburgh; York Street, Manchester, 1; St. Andrew's Crescent, Cardiff; 15, Donegall Square West, Belfast; or through any ordinary bookseller.

THE INFLUENCE OF A UNIFORM JET ON THE LIFT OF AN AEROFOIL. By H. Glauert, F.R.S. (Revised by H. B. Squire, M.A., December, 1935.) Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1602. (14 pages and 5 diagrams.) January, 1934. Price 1s. net.

A knowledge of the lift of an aerofoil in a jet of increased or reduced velocity is of considerable interest, and an approximate theoretical solution of the problem is valuable as a foundation on which to base systematic wind tunnel experiments.

Theoretical formulæ have been derived for the lift of an aerofoil in the presence of a jet of uniform velocity, or in the presence of an infinite series of such jets. The analysis is confined to motion in two dimensions, and is limited by the condition that the induced velocity caused by the aerofoil at the nearest surface of discontinuity must be small compared with the velocity of the undisturbed flow.

The calculations indicate that the lift of an aerofoil is increased by a jet of increased velocity passing above it. When the aerofoil is in the jet, the lift is a maximum in a position slightly below the centre of the jet and also decreased rapidly when the breadth of the jet is less than the chord of the aerofoil. The theoretical results are in general agreement with experimental results giving the effect of a slipstream on the lift of an aerofoil

A GRAPHICAL METHOD OF CALCULATING THE PERFORMANCE OF AN AIRSCREW. By C. N. H. Lock, M.A., of the Aerodynamics Department, N.P.L. R. & M. No. 1675. (30 pages and 10 diagrams.) October 25, 1934. Price 2s. net.

A rapid method is described of making calculations of airscrew performance by means of charts. The first application is to ordinary strip theory calculations. Six charts are required for each radius for which the value of thrust grading, etc., are to be derived; of these 6, 4 depend on the number of blades but are otherwise universal, and the remaining 2 charts involve the lift and drag curves of the section.

The second application gives a considerable further simplification in that the charts are required for a single standard radius (0.7) only; the thrust coefficient corresponding to a given working condition can then be deduced by a simple operation with 3 charts while the torque involves 3 further charts and a simple addition.

An analysis of the results of the "wind tunnel tests of high pitch airscrews" shows that the method will give reasonably consistent results over a range of pitch ratio from 0.3 to 2.5, while there is little doubt that the method will cover the range of blade width likely to occur in practice. Changes of blade section and also of plan form and twist may be allowed for if necessary by modifying the lift and drag curves. The second method has also been remarkably successful in its application to the stalled range of an airscrew, a range in which there is at present no other available method. Also, the first method may prove convenient for analysing wind tunnel tests of model airscrews at high tip speed.

FLIGHT TESTS ON AN ATLAS FITTED WITH AUTOSLOTS HAVING VARIOUS LINK ARRANGEMENTS. By W. G. Jennings, B.Sc. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1677. (7 pages and 5 diagrams.) March, 1932. Price 9d. net.

There has been some divergence of practice in the design of the link mechanisms of wing tip automatic slots. One method is based on the provision of an adequately convergent slot passage from entrance to exit for all partial openings of the slot; in this arrangement the slot commences to open at a low incidence and then continues to open progressively as the air speed is reduced. In another design the opening of the slot is delayed to a low speed and then the opening occurs suddenly. These two methods of design lead to somewhat different positions of the slat in the fully open position, and it was considered desirable to compare the two arrangements by flight tests. It was also required to determine whether the existing autoslots on the standard Atlas aircraft were satisfactory, and if not, whether they could be improved.

Flight tests have been carried out with four types of autoslot linkages fitted to an Atlas. (*a*) "Convergent passage" type. (*b*) "Delayed opening" type. (*c*) Standard. (*d*) Standard (modified).

When fully stalled the aircraft behaves much the same when fitted with any of the above types of autoslot. The stability is good, but the control is ineffective. The "delayed opening" scheme has the advantage that the slot is kept closed at all speeds above climbing speed, but the correct amount of delay required to give satisfactory results is somewhat critical. In normal flight the lateral control of the aircraft deteriorates in a marked manner between 60 m.p.h. and 70 m.p.h. This lack of control is independent of the autoslot and occurs in the unslotted aircraft to the same degree. It may be due to the horn-balanced ailerons. No advantage is to be gained by modifying the existing standard autoslot which is considered satisfactory.

THE STABILITY OF A MONOCOQUE IN COMPRESSION. By J. L. Taylor, D.Sc., A.M.I.N.A., of the Design Staff of Sir W. G. Armstrong-Whitworth Aircraft, Limited. R. & M. No. 1679. (9 pages and 2 diagrams.) June 6, 1935. Price 6d. net.

Theoretical formulæ have been derived for the stable compression load on a flat or curved monocoque (stiffened-skin) panel, analogous to the well-known expressions for the stable load of a flat sheet and thin tube respectively. A numerical example shows that the load for a flat panel is much smaller than for a panel with moderate curvature. The flat panel must have relatively heavy frames to develop the same stress before waving as the curved panel. Some form of transverse stiffening of the skin is, however, necessary if advantage is to be taken of the curvature.

THE ROYAL AIR FORCE

SERVICE NOTES AND NEWS — AIR MINISTRY ANNOUNCEMENTS

INTERCEPTOR FASHION: The climb of the new Handley Page medium bomber, in this striking picture, suggests the fighter of not so very many years ago. (*Flight* photograph.)

MOHMAND OPERATIONS, 1935

His Majesty the King has been graciously pleased to command that the India General Service Medal, bearing on the obverse the Crowned Effigy of His late Majesty King George V, with clasp "North West Frontier 1935" shall be granted, provided the claims are approved by the Air Council, to the personnel of the Royal Air Force who took part in the operations against the Mohmands on the North West Frontier of India, between midnight August 15-16 to midnight October 15-16, 1935.

The medal and clasp will be granted to officers and airmen:—

(a) Who were on the strength of, or attached to, No. 20 (Army Co-operation) Squadron and who served within the following geographical limits:—

Working from the East, down the Swat River to the Administrative Border; thence South West along the Administrative Border, including Kilagai Camp, to the Kabul River, thence along the Kabul River.

(b) Who were attached to, and who actually served as officers or airmen with the Royal Air Force units which engaged in the operations and operated from Peshawar, Risalpur and Kohat.

Individuals previously awarded the medal will receive the clasp only. Officers no longer serving may obtain a copy of the form of application from the Secretary, Air Ministry; and airmen no longer serving from the Officer-in-Charge of Records, Royal Air Force, Ruislip, Middlesex. When completed, the form should be forwarded direct to the Secretary, Air Ministry.

No. 2 (BOMBER GROUP)

No. 2 (Bomber) Group will take over executive command with effect from August 1. The *postal address* will be:—No. 2 (Bomber) Group, Royal Air Force, Abingdon, Berks.

No. 2 (Bomber) Group will comprise the following units:—R.A.F. Station, Abbotsinch, No. 21 (B) Squadron, No. 34 (B) Squadron, R.A.F. Station, Turnhouse, No. 83 (B) Squadron, R.A.F. Station, Hucknall, No. 98 (B) Squadron, and No. 104 (B) Squadron.

FORMATION OF STATION HEADQUARTERS

A station headquarters will form at Catterick on August 5, 1936.

A station headquarters will form at Scampton on August 27, on which date the station will be placed under the command of the A.O.C.-in-C., Bomber Command, in No. 3 (Bomber) Group. The *postal address* will be:—Royal Air Force Station, Scampton, Lincoln. Railway station:—Lincoln (L.N.E.R.).

MOVES OF SQUADRONS

No. 58 (Bomber) Squadron will move from Upper Heyford to Driffield on September 3.

No. 98 (Bomber) Squadron will move from Abingdon to Hucknall. The move is to be completed by August 21. The squadron will be administered by the A.O.C., No. 2 (Bomber) Group.

No. 102 (Bomber) Squadron will move from Worthy Down to Finningley on September 3.

No. 104 (Bomber) Squadron will move from Abingdon to Hucknall. The move is to be completed by August 21. The squadron will be administered by the A.O.C., No. 2 (Bomber) Group.

No. 206 (G.R.) Squadron will move from Manston to Bircham Newton. The move is to be completed by August 4. On the completion of the move, the squadron will be placed in the Coastal Command.

No. 215 (Bomber) Squadron will move from Upper Heyford to Driffield on September 3.

No. 7 (Bomber) Squadron will move from Worthy Down to Finningley on September 3.

No. 18 (Bomber) Squadron will move from Bircham Newton to Upper Heyford. The move is to be completed by September 10.

No. 49 (Bomber) Squadron will move from Bircham Newton to Worthy Down. The move is to be completed by August 10. On the completion of the move the squadron will be placed in No. 3 (Bomber) Group, until September 3, on which date it will be transferred to No. 2 (Bomber) Group.

LONG SERVICE AND GOOD CONDUCT MEDAL

The Long Service and Good Conduct Medal has been awarded to the undermentioned airmen:—

W.O.s Barnard, W. J. S., Briggs, S. J., Dell, G. F., Hester, A. E., Mather, S., Sallows, J. S., Smith, J. S., Vautier, B. A., W.O.2 Patterson, E. A., F./Sergts. Ansell, A. G., Atkins, H. J., Bannerman, J. S. C., M.C., D.C.M., Bateson, W., Beaumont, F. B., Blake, H. G., Blundell, A. E., Briden, S. G., Briggs, R. D., Brock, H. W., Burleigh, A. H., Chapman, J. B. K., Chase, L. J., Chatfield, B. A., Clarke, A., Clay, F. R., Clough, C. C., Cockell, G. F., Cole, G. G., Collins, G. A. V., Cronkshaw, C. H., Davies, T. T., Davis, E. W., Digby, J., Dod, G., Ellison, E. J., Frost, W. J., Gent, H. W. G., Gilvary, R. F., Gough, R. D., Graver, S. F., Gray, W. E., Hancock, R. W., Henwood, F. W., Jones, A. T., M.M., Kiddier, N., Lloyd, G. J., Lochead, D. G., Lucas, T. H., Malin, W. J., Maxted, F. A., Murray, H., Nicklin, C. H., Pape, F. M., D.F.M., Peel, F., Redford, G., Ross, E. C., Saunders, M. W. S., Scholfield, R., Smith, D. W., Speight, J. H., Thorogood, C. H., Tugwell, L. T., Turner, W. A.,

Walker, W. J., Whitston, T., Wilkins, E. A. C., Wilson, H., Wilson, W. R., Sergts. Armstrong, G. E., Atkinson, T. W., Balment, W. B., Barber, H. S., Barnes, C., Blencowe, J. H., Brown, A. J., Browne, A. G. B., Castle, G. D., Chandler, H. F., Chell, L. A., Colson, G. A. T., Davey, F. J., Davies, D. T., Dixon, W., Ebbett, R. W., Ellis, H. R., Elphick, P. V. W., Emptage, W. C., Ford, A. H., Geer, S. B. H., Hilder, A. E., Johnston, A., Kennard, H. W., Lancaster, J., Langstone, T. E., Lewis, A. V., Lipscombe, R. P., MacArthur, G., Mayhew, C., McTeague, T. P., D.C.M., E.G.M., Mellor, A., Middleton, H. A. R., Morris, W. H. J., Morrison, R., Mullard, D. J., Parker, E. H., Pfeil, H., Plumbridge, H. G., Pollock, J., Poulter, W. J. E., Robinson, L., Ross, J., Silvester, F. J., Want, R. E., Cpls. Bernard, A., Biddle, W. J., Body, R. F., Boston, W. E., Brangan, M., Cpl./A/Sergt. Brown, G. F., Cpls. Burton, P. P., Burwood, F. T. W., Cpl./A/Sergt. Curtis, A., Cpl. Eades, J., Cpl./A/Sergts. Elliott, G. A. R., Farrar, W., Cpls. Gale, A. L., Gott, C. F., Grainger, T., Green, H., Cpl./A/Sergt. Halls, H. R., Cpls. Holliday, G. J. E., Holmes, H., Hull, G. H., Cpl./A/Sergt. Jordan, H. J., Cpls. Kemp, H. W. J., Kennard, F. S., Kirby, W. P., Lang, A. F. C. S., Spl./A/Sergt. Macey, C. F., Cpls Mallett, J. S., Marner, P., Cpl./A/Sergt. Medcalf, F. R., Cpl. Millard, V. H. W., Cpl./A/Sergt. Phelan, J., Cpls. Pike, T. A., Raby, B., Cpl./A/Sergt. Rhodes, J., Cpls. Richardson, J. G., Sainsbury, M.C., Sampson, C., Slack, J. T., Steele, J. J., Thomas, W. J., Wo[r]man, L. E. A., Wright, C. S., Yandall, W. J. L.A.C. Hayes, J. J.

NOVAR CAMP

The administration of Novar Camp has been transferred to the R.A.F. Station, Donibristle, with effect from July 10.

ADMINISTRATION OF STATIONS

The R.A.F. Station, Bircham Newton, will be transferred to the Coastal Command with effect from August 10.

The R.A.F. Station, Worthy Down, will be transferred to No. 2 (Bomber) Group with effect from September 3.

ROYAL AIR FORCE GAZETTE

London Gazette, July 21, 1936

General Duties Branch

The following Flight Lieutenants are granted permanent commissions in that rank with effect from the dates stated: G. A. G. Johnston, K. Lea-Cox, C. E. Morse, D. H. Marsack (June 1); G. L. Menzies (July 11); D. W. Reid (July 13).

W. D. Woods is granted a permanent commission as Pilot Officer with effect from June 7, 1934, and with seniority of Dec. 7, 1932. (Substituted for notification in the *Gazette* of June 26, 1934.)

The following are granted short service commissions as Acting Pilot Officers on probation with effect from and seaiority of July 6: R. D. Baugham, N. C. Beck, R. N. Belgrove, C. H. Boxall, M. H. Brown, E. C. Cathels, R. T. Collier, S. H. Cruise, E. H. Dally, F. R. Jeffs, D. J. Lay, W. W. Macfarlane, J. H. G. McArthur, R. A. Milburn, H. G. Mossford, H. O'Neill, T. W. Piper, H. P. Pleasance, D. S. Richardson, T. W. Rowley, K. R. Russell, E. L. Shankland, N. L. Smith, P. P. Troughton-Smith, T. C. Weir, B. R. Whaley, C. S. F. Wood.

The following Flying Officers are promoted to the rank of Flight Lieutenant with effect from the dates stated: J. F. Stephens (April 1); T. H. L. Nicholls (June 30).

Pilot Officer W. D. Woods is promoted to the rank of Flying Officer with effect from December 7, 1934, and with seniority of June 7, 1934. (Substituted for notification in the *Gazette* of June 4, 1935.)

The following Pilot Officers are promoted to the rank of Flying Officers with effect from the dates stated: P. C. Vickery, E. M. T. Howell, E. L. F. Meynell, H. R. Coventry, R. D. A. Wills, J. L. Crosbie (June 15); J. C. Taylor (June 22).

Flt. Lt. R. Hanson is transferred to the Reserve Class A (July 12); Flt. Lt. C. L. Monckton is transferred to the Reserve Class C (July 12); Acting Pilot Officer on probation J. M. Evans relinquishes his short service commission on account of ill-health (July 18); the short service commission of Acting Pilot Officer on probation R. W. Aitken-Quack is terminated on cessation of duty (July 11).

Accountant Branch

Pilot Officer on probation H. C. Fleming is confirmed in rank and promoted to the rank of Flying Officer (June 12).

Medical Branch

The commission of F/O. D. W. I. Thomas is antedated to Aug. 17, 1935, and he ceases to be seconded to St. George's Hospital with effect from June 30.

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Wing Commanders.—G. B. A. Baker, M.C., to D.T.D., Dept. of A.M.R.D., Air Ministry, 9.7.36. R. T. Leather, A.F.C., to D. of O., Dept. of A.M.S.O., Air Ministry, vice Air Comdre. A. G. R. Garrod, O.B.E., M.C., A.F.C., 10.7.36.

Squadron Leaders.—J. Potter, to No. 58 (B) Squadron, Upper Heyford, to command vice Sqn. Ldr. V. E. Groom, D.F.C., 14.7.36. R. H. S. Spaight, to R.A.F. Station, Gosport, for flying duties vice Sqn. Ldr. J. G. Walser, M.C., 11.7.36.

Flight Lieutenants.—J. K. Brew, to Air Armament School, Eastchurch, 14.7.36. J. Goodhart, to No. 2 Armament Training Camp, North Coates Fitties, 9.7.36. G. A. L. Manton, to No. 607 (Co. of Durham) (B) Squadron, 17.7.36. J. C. Cunningham, to Headquarters, No. 1 (B) Group, Abingdon, 13.7.36. D. Y. Feeny, to R.A.F. Station, Manston, 13.7.36. A. W. S. Matheson, to No. 609 (West Riding) (B) Squadron, Yeadon, 13.7.36. J. W. A. Hunnard, to No. 610 (Co. Cheshire) (B) Squadron, Hooton Park, 13.7.36. R. H. A. Leigh, to No. 1 Flying Training School, Leuchars, 13.7.36. J. N. H. Whitworth, to Station Flight, Abingdon, 13.7.36. R. G. S. Morgan-Smith, to R.A.F. College, Cranwell, 13.7.36. D. M. Somerville, to No. 8 Flying Training School, Montrose, 13.7.36. R. C. M. Collard, to No. 9 Flying Training School, Thornaby, 13.7.36.

Flying Officers.—I. J. McGhie, to No. 1 Flying Training School, Leuchars, 13.7.36. D. S. Radford, to No. 5 Flying Training School, Sealand, 13.7.36. D. P. McKeown, E. P. P. Gibbs, G. J. Grindell, and J. H. R. Oldfield, to No. 9 Flying Training School, Thornaby, 13.7.36. V. E. Maxwell and A. F. Hamilton, to No. 10 Flying Training School, Tern Hill, 13.7.36. J. F. H. de Boulay, J. W. Young, and H. G. L. Allsop, to No. 11 Flying Training School, Wittering, 13.7.36. D. G. Lewis, to Station Flight, Duxford, 13.7.36. H. J. Kirkpatrick, to Station Flight, Abingdon, 13.7.36. J. R. A. Peel, to R.A.F. College, Cranwell, 13.7.36. H. D. U. Denison, to No. 3 Flying Training School, Grantham, 13.7.36. J. S. McLean, to No. 5 Flying Training School, Sealand, 13.7.36. M. Hastings, to No. 8 Flying Training School, Montrose, 13.7.36. P. S. Salter, to No. 611 (West Lancs.) (B) Squadron, Speke, 13.7.36. M. Downey, to Headquarters, Fighter Command, Stanmore, 14.7.36. E. J. Boyle, to No. 1 Flying Training School, Leuchars, on appointment to a temporary commission on being seconded from the Army, 5.7.36.

Acting Pilot Officers.—The undermentioned are posted to No. 5 Flying Training School, Sealand, with effect from July 11:—W. W. Campbell, P. F. E. Elstob, R. V. Evers-Swindell, C. L. Haddon, D. M. Hewson, C. E. Harris, J. R. Hollington, C. S. Kemp, E. C. Le Mesurier, H. B. Lightoller, E. C. Lilburn, P. W. Lillie, T. D. M. Macdonald, A. D. V. Morum, A. W. Oldroyd, D. G. Perry, H. P. Powell, C. G. S. Robinson, G. A. Roden, H. C. Sammels, B. A. Sisson, G. H. Stephens, E. W. Sykes, C. S. Thomas, P. E. Warne and B. B. Willmott.

G. S. K. Haywood, to No. 5 Flying Training School, Sealand, 14.7.36. L. E. Abel and R. B. Carr, to No. 40 (B) Squadron, Abingdon, 13.7.36. F. D. Beales and K. G. Sharp, to No. 218 (B) Squadron, Upper Heyford, 13.7.36. R. Bickford, to No. 10 (B) Squadron, Boscombe Down, 13.7.36. G. K. Buckingham, to No. 98 (B) Squadron, Abingdon, 13.7.36. D. H. Burnside, to No. 58 (B) Squadron, Upper Heyford, 13.7.36. V. S. Butler and J. C. Richards, to No. 18 (B) Squadron, Bircham Newton, 13.7.36. K. C. Doran and B. S. Tomlin, to No. 102 (B) Squadron, Worthy Down, 13.7.36. A. G. Duguid, to No. 99 (B) Squadron, Mildenhall, 13.7.36. A. J. Elliott, to No. 23 (F) Squadron, Biggin Hill, 13.7.36. H. M. Hammond and W. D. Morford; to No. 57 (B) Squadron, Upper Heyford, 13.7.36. C. H. Heber-Percy, to No. 1 (F) Squadron, Tangmere, 13.7.36. L. C. Jones-Bateman, to No. 17 (F) Squadron, Kenley, 13.7.36. M. N. McF. Kennedy and J. P. M. Woolley, to No. 15 (B) Squadron, Abingdon, 13.7.36. R. D. B. MacFadden, to No. 38 (B) Squadron, Mildenhall, 13.7.36. V. R. Paterson and J. S. Scott, to No. 97 (B) Squadron, Boscombe Down, 13.7.36. C. S. H. Richardson, to No. 9 (B) Squadron, Aldergrove, 13.7.36. G. A. W. Saunders, to No. 65 (F) Squadron, Hornchurch, 13.7.36. K. H. Savage, to No. 56 (F) Squadron, North Weald, 13.7.36. W. L. Warner, to No. 214 (B) Squadron, Andover, 13.7.36. R. H. Adams and C. B. Lamb, to School of Air Navigation, Manston, 13.7.36.

The undermentioned are posted to the R.A.F. Depot, Uxbridge, on appointment to short service commissions as Acting Pilot Officers, on probation with effect from July 6:—R. D. Baughan, N. C. Beck, R. N. Belgrove, C. H. Boxall, M. H. Brown, E. C. Cathels, R. T. Collier, S. H. Cruise, E. H. Dally, F. R. Jeffs, D. J. H. Lay, W. W. Macfarlane, J. H. G. McArthur, R. A. Milburn, H. G. Mossford, H. O'Neil, T. W. Piper, H. P. Pleasance, D. S. Richardson, T. W. Rowley, K. R. Russell, E. L. Shankland, N. L. Smith, P. P. Troughton-Smith, T. C. Weir, B. R. Whaley, and C. S. F. Wood.

Stores Branch

Flight Lieutenants.—P. Alderson, to H.M.S. "*Courageous*," 15.7.36. W. F. Langdon, to D. of E., Dept. of A.M.S.O., Air Ministry, 14.7.36.

Accountant Branch

Flight Lieutenants.—C. F. Goatcher, to Administrative Wing, Halton, 10.7.36. W. F. Quilliam, to No. 8 Flying Training School, Montrose, 13.7.36.

Medical Branch

Squadron Leader.—F. B. C. L. B. Crawford, to No. 10 Flying Training School, Tern Hill, for duty as Medical Officer, 16.7.36.

Flight Lieutenants.—O. S. M. Williams, to R.A.F. Station, Abbotsinch, 13.7.36. R. E. Alderson, to Princess Mary's R.A.F. Hospital, Halton, 15.7.36.

COMMERCIAL AVIATION

— AIRLINES — AIRPORTS —

NIGHT MAIL: This country's first real night mail service was opened by British Airways on Monday. Leaving Gatwick at 10 o'clock, the mails reach Stockholm at 8.20 on the following morning. For the moment they are carried by A.B. Aerotransport from Hanover.

THE WEEK AT CROYDON

What Croydon is Saying About the Proposed B.A. and B.C.A. Amalgamation : A Visit from the Giant Junkers : Dodging the Sportive R.A.F. : Airline Pilots Play with a Single-seater

THE main topic of conversation at Croydon last week was the amalgamation of British Continental Airways with British Airways. The Air Ministry heaved a sigh of relief when the announcement was made, for the position was becoming increasingly difficult. An end will now come to wasteful competition on the Scandinavian route, and British interests on that line will be correspondingly stronger. The K.L.M. and A.B.A., who have long ruled the roost in that direction with their "Scandinavian Air Express," and the other foreign companies who offer London-Scandinavian air connections, will have to look to their laurels. The foreigners will feel the draught, especially if the new combine, backed by the Government, is able to put a stop to the Railway Clearing House situation which, in effect, gives the foreign companies on various routes preference in passenger bookings from England—a ridiculous situation which cannot continue much longer.

The South American Tenders

Croydon is also wondering whether the combined tender of these two companies, B.A. and B.C.A., for the South American route, will not now be accepted, as it is understood that the other competitors will have difficulty in mustering the same experience, talent, and finance as the new combine. We are wondering, too, if landplanes or boats will be used on the South American route. Another question of interest is whether B.A. will come to Croydon or B.C.A. will join their new partners at Gatwick.

Last week we had a visit from the big German G.38, *Field-Marshal von Hindenburg*, which has not been here since the days when *Heracles* (or was it *Hannibal*?) was newly delivered. The machine's four Diesel engines have improved its performance, but give forth unaccustomed trails of smoke as it takes off, causing the uninitiated to rush round screaming "Fire!" Our old friend Capt. Brauer was in command, no less genial and popular than of yore, and, incidentally, not much slimmer. They say the huge machine was expressly built to accommodate him, but that is probably a libel by one of his British fellow pilots. Anyway, the laugh was *not* on Brauer when he landed and shook hands with a British pilot's beard, at the same time making a noise like a goat, which, incidentally, sounded like a couple of lions roaring. Everyone was delighted to see him and his big ship. He brought a huge number of racing pigeons from Germany to Lympne, and on the return journey from Croydon his machine supplemented the regular D.L.H. 6 p.m. service, and he flew London-Berlin non-stop.

Last Friday a special French aeroplane arrived with Premier Blum from Paris. They do things in style over there, for the pilot, as befitted the occasion, was magnificently uniformed, and wore the festoons of gold lace about the shoulders we associate with staff officers. Some people smiled, but, after all, civil aviation is as worthy of such glittering gauds as any other uniformed profession or occupation.

On Sunday Air France ran special machines to the vicinity of Vimy Ridge for the ceremonies there and back the same day. Everybody expects tremendous traffic for August Bank Holiday week-end, and Air France has already announced "quintruplicated" services, by which, doubtless, their printer meant quintuplicated. Anyway, it shows what the traffic is like.

One of the newspapers, describing recent tests of an Autogiro, said the machine kept "popping out of the gorse

in an amazing manner." It is nothing to the way in which the R.A.F. keeps popping out of the clouds on various sections of the Continental air routes. It is most disconcerting for civil pilots, for it is impossible for the control tower people to warn pilots of the whereabouts of the military, except to say that at any moment of the day or night any number of them may be practising cloud flying over 3,000 ft. all over the air routes. If it is merely a matter of cloud flying, there are numerous first-class clouds over Salisbury Plain, which really do not differ much in composition from those round Croydon.

Imperial Airways started a new service to Le Touquet last Thursday, conveniently arranged so that passengers get there in time for dinner and leave again next morning around breakfast time, getting in at Croydon in time for a latish (and presumably slightly guilty-looking) appearance at the office in London.

Mr. Brian Allen is extremely pleased with the little Tipsy monoplane for which his firm has the agency. He flew it to Ramsgate and back last week during a gale, of which even airline pilots spoke with respect. Not only did it behave admirably in the air, but was extremely stable on the ground in the high wind, owing to its wide undercarriage and low wing. Numerous airline pilots have flown it, and are much impressed.

A. VIATOR.

Germany and the North Atlantic

THE German D.L.H. has been granted permission by the Portuguese Government to carry out a series of twelve trial flights across the North Atlantic, using Portuguese territory (Lisbon and the Azores Islands) as two of the stages. This information was disclosed by the National Air Council, which further stated that the Do. 18, with Jumo oil engines, would be used. No mention is made of passengers, either on the trial runs or subsequently. The boats will be catapulted from a ship lying off the Azores, and will proceed to the North American terminus (not stated) *via* Bermuda.

The Night Mail to Scandinavia

LAST Monday night British Airways, Ltd., inaugurated their Scandinavian night mail service, a D.H.86 leaving in Gatwick's very efficient flood-lighting at 10 p.m. At the controls were Mr P. W. Lynch-Blosse, operating superintendent of the Company, and First Officer V. Flowerday, and in the hold was a quarter of a ton of mail.

By arrangement with A.B. Aerotransport, the mail is flown to Hanover (with a call at Cologne), where it is handed over to the Swedish Company. In the reverse direction, A.B. bring it as far as Hanover.

The service operates outward on Mondays to Fridays, inclusive, and inward on Tuesdays to Saturdays, inclusive.

The Postmaster General has announced that the new service makes it possible to send letters and postcards by air to Denmark, Sweden, Norway and Finland at the ordinary international postage rates of 2½d. for the first ounce and 1½d. for each additional ounce (postcards 1½d.). Practically the whole of the letters and postcards posted to the countries in question will in future be sent by air in normal course.

British Airways' Traffic

DURING the nine months ending June 30, the machines of British Airways completed 7,602 flights on regularly scheduled services and covered 943,248 miles. The number of incompleted or delayed flights on all services has been extremely small, particularly on the London-Malmo-Stockholm route, which has been operated since the inauguration of the mail service, on March 17, with 100 per cent. regularity.

Well over two million passenger-miles have been flown. During the third quarter the total number of passengers carried exceeded by 396 the total of the previous six months, and the total for the nine months ending June 30 was greater than that for the twelve months ending October, 1935. Over half a million pounds of mail and freight has been transported.

Radio in East Africa

IMPORTANT technical surveys, carried out in connection with the forthcoming flying-boat route of Imperial Airways down the east coast of Africa, have just been completed by Capt. Durrant, superintendent of Empire air routes' wireless, and Mr. R. A. Munday, the aviation expert of the Marconi Company. Arrangements were made, during these surveys, for new stations containing the latest forms of equipment to be installed at Mombasa, Dar-es-Salaam, Lindi, Mozambique, Quilimane, Beira, Inhambane and Lourenço Marques. He will next concern himself with wireless developments on Persian Gulf sections of the England-Australia route. Discussing progress on the East Africa coast, Capt. Durrant paid a warm tribute to the co-operation of the Portuguese authorities. It may be remembered that Capt. Durrant was wireless officer in the R.34 when that famous airship made her flight to and fro across the Atlantic.

AERODROME OWNERS' LIABILITY

ON the 23rd, in the King's Bench Division, a case of interest to all owners and aerodrome managers was decided between F. Hills and Sons and British Airways. The facts were briefly as follows:

The plaintiffs' (F. Hills and Sons) pilot flew over from the mainland to demonstrate the Praga Baby. On arriving at Ronaldsway he discovered that no hangar accommodation was available and telephoned to British Airways, and was informed that accommodation was available at Ramsey, where his machine was garaged on the nights of February 9 and 10.

On each occasion the machine was placed in the hangar in front of the defendants' three-engined mail machine, and the portion of the hangar available for use did not permit of the plaintiffs' machine being put in in any other position. The plaintiffs' pilot was aware that the defendants' machine would have to be got out early on the morning of the 11th for the service and that it would be necessary to move his machine outside. At 7 a.m on that morning it was accordingly moved with one man on each wing tip and one at the tail. When about fifteen feet out from the hangar they turned the machine into the wind with the tail held about two feet above the ground, and proceeded to wheel it backwards for the purpose of getting it into the sheltered space. While so wheeling it two fierce gusts of wind struck the machine one after another, the first tilting it on to the starboard wing tip and the second blowing it completely over on to its back. Damages were originally claimed both for the cost of repairs and for a substantial sum for loss of profits, but were ultimately agreed at £250.

The evidence of the defendants was to the effect that when they got the machine out of the hangar the wind was blowing at 30 to 35 m.p.h., which was about the same strength as the wind on the previous day, when the machine had been flown without trouble. While they were moving it the wind greatly increased in force and blew from a more easterly direction, thereby causing the accident. They were satisfied that in the conditions prevailing it was perfectly safe to take the machine out with three men. The evidence for the plaintiffs was that a violent gale was blowing on the day in question, and they argued that it was negligent on the part of the defendants to remove the machine from the hangar without at least doubling the number of men to hold it. The evidence of the official weather reports was that at 7 a.m., the time at which the machine was removed, the mean strength of the wind at Point of Ayre was south-east 35 m.p.h. At 7.30 the strength at Ronaldsway was east 59 m.p.h.

In giving judgment Mr. Justice Lewis said that he was satisfied that this was a case of gratuitous bailment, but this still left upon the bailees the obligation of taking the same care of the aeroplane as they would have done had it belonged to themselves. He held that even assuming that the wind was only 35 m.p.h. when the aeroplane was removed, the defendants' employees should have recognised that gusts of gale force, and possibly from a different direction, must be anticipated, and that the gusts which caused the accident could not be considered as an act of God, the consequences of which would be unavoidable. On these grounds he held that there had been negligence on the part of the defendants' employees such as to render the defendants liable, and gave judgment for the plaintiffs for £250 and costs.

Penshurst Closed

ON Tuesday, July 28, the Penshurst landing ground was closed and the airway beacon ceased to operate. The licence has lapsed and no facilities will be available in future.

A New Terminus?

IF the present plans are carried out, it appears likely that new premises will be built at Victoria for Imperial Airways to include a station to facilitate rail transport to and from aerodromes near London. The Westminster City Council's works committee have examined the plans and report that they can see no objection to the proposal.

The suggested site is on the east side of Buckingham Palace Road, south of Elizabeth Bridge.

International Common-sense

International Organisation in European Air Transport. (Oxford University Press, Humphrey Milford, Amen House, London, E.C.4. 15s.)

ALTHOUGH, as the American author, Dr. Laurence C. Tombs, explains in his introduction, the purpose of this book is not necessarily to support the idea of the internationalisation of civil aviation, the information obtained therein does show the progress which is being made in real international organisation. In the field of air transport, particularly, the sovereign states have realised that they must "act in the interests of the world society if they are to serve best the interests of their own nationals." Dr. Tombs has had long and valuable experience as a member of the Communications and Transit Section of the League and so is thoroughly qualified to write such a book.

International Organisation covers the relations between military and civil aviation before, during and after the last war; deals with the arrangements of long-distance services and subsidies; with international companies (of which Deruluft is given as a good example); with pooling systems; and explains the whole complicated business of air law. So far as we know, in no other book has such a monumental effort been attempted in normally readable form, and everyone who is interested in the more serious political problems in air transport will find it a mine of information.

At Singapore

THE new land-sea airport at Singapore, which will cost something like a million pounds sterling, is now well on its way towards completion. A seaplane slipway and hangar for the new boats are taking shape, the steelwork of the terminal building on the airport has been erected, and the concrete apron has been laid.

A taxying runway is being laid around a large part of the landing area and from this, presumably, prehensile take-off runways will radiate towards the centre. On the other side of the river, according to a correspondent of the *Daily Telegraph*, a landing ground is being prepared for the use of the Royal Volunteer Flying Force.

On and On and On

THE Bristol Aeroplane Co., Ltd., have received from W. S. Shackleton, Ltd., an interesting letter which sheds light on air transport work in New Guinea, and at the same time forms a remarkable tribute to British workmanship and materials.

"Pacific Aerial Transport Co." (says the letter) "fitted a Jupiter VI engine which we supplied them to a DH 50 aeroplane. This machine, piloted by Dick Allen, broke the record between Wau and Salamaua by making *fifteen double journeys* in one day, carrying full load each time. This is a remarkable day's work for engine, machine, pilot and ground staff as the air line distance between Wau and Salamaua is quite 40 miles, so that the pilot flew 1,200 miles. Also, the machine was unloaded at Wau each trip and fully loaded again at Salamaua. The machine was refuelled at the end of each double trip. Also, although the air line between Wau and Salamaua is only 40 miles, the aerodrome at Salamaua is at sea level, whilst the 'drome at Wau is at 3,500ft., and it is necessary for aeroplanes to fly at a height of over 6,000ft. in order to get over the Black Cat Pass. The Bristol Jupiter VI engine used to make this record was No. J6457.

"Pacific Aerial Transport Co. are still using Bristol Jupiter VI engine No. J6074 daily. This engine has now a running time of over 4,000 hours to its credit, and it is still fitted with the *original* cylinders and giving every satisfaction."

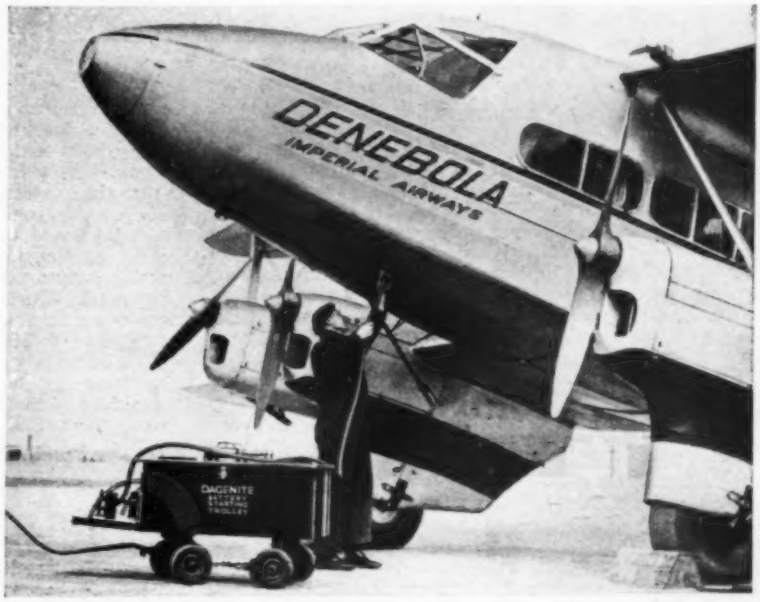
Quite the most noteworthy point is that the two engines mentioned were delivered in 1929 and 1926 respectively.

FOR EASIER STARTING

SHOWN in the accompanying illustration is an aerodrome accessory which should prove extremely useful to airline operators, especially in cases where there are large numbers of engines to be started from cold. It is the new Dagenite battery trolley, which has been evolved by its makers, Peto and Radford, in close co-operation with the ground staff of a number of prominent operating companies.

The trolley consists of a stout oak container on a sturdy metal four-wheeled undercarriage, one pair of wheels being steerable by means of the pivoted draw-handle. Releasing the handle causes two spring-loaded brake shoes to come into operation on the rear wheels. The container is divided into two sections, one housing two special high-capacity Dagenite starter batteries connected in series to give twelve volts, and the other containing brackets to accommodate the rubber-insulated feeder cable. There are a number of practical detail fitments, such as a device which makes short circuiting of the feeder plug impossible when the trolley is not in use. The capacity of the batteries is 170 ampere hours at the 10-hour rate of discharge. By way of example, it may be stated that consecutive discharges of 10 seconds' duration, with one minute between each, can be made to the number of 489 at 100 amperes, or 134 at 300 amperes.

Full details regarding the trolley—which is priced at £22 15s.—are obtainable from the makers, Peto and Radford, 50, Grosvenor Gardens, London, S.W.1.



The new Dagenite starter-battery trolley, described in the accompanying paragraph.

THE FUTURE of the KING'S CUP RACE

Major Alan Goodfellow, Clerk of the Course, Comments on "Flight's" Recent Criticisms of the Conditions of the Event

THE criticisms of the Royal Aero Club's organisation of the King's Cup Race in *Flight* of July 16 have spurred me to put in writing some of the thoughts and problems which have been exercising my mind for some time past. I must make it clear at the outset that, although I am a member of the R.Ae.C. racing committee and have been concerned in one capacity or another with the King's Cup Race for the last ten years, my expressions of opinion are purely personal, and must not be taken as the official views of the committee.

It has been asked what definite objective the Club had in mind in connection with the race. As I see it, the objectives which we have been trying to achieve are as follows:—

(1) An all-round improvement in the performance of civil aircraft;

(2) a similar improvement in the standard of sporting pilots;

(3) an increase of the public interest in flying.

To this must be added the unfortunate, but necessary, qualification that the race shall be run in such a form as not to involve an undue strain upon the exchequer of the Royal Aero Club.

Trial and Error

The history of the King's Cup Race has been one of trial and error, as one might expect, but on the whole the various experiments have met with more success than failure. If anyone doubts this, let him compare the lists of starters and finishers in each of the races, and the speeds achieved by the finishers as a whole in proportion to horse power and load capacity. I do not suggest that these figures prove conclusively that the King's Cup Race has been responsible for the all-round improvement in performance of the smaller types of civil aircraft, but, at least, they negative any suggestion that it has been the reverse. Moreover, despite stiff courses and bad weather, the results have been achieved with the loss of but a single life, which compares favourably with any similar results achieved by motor races.

I propose to consider briefly how far this year's race met the objectives mentioned above, and then to discuss the various alternatives which have been tried or suggested. In doing so, I start from the assumption that this year's event was a reasonably good example of organisation for a race in this particular form. (Lest it be thought that this comes badly from the Clerk of the Course, who is nominally in charge of the race, let me explain that his job under existing conditions is more or less a sinecure in normal circumstances. With De Havillands in charge of the ground organisation, Harold Perrin in "the office" and St. John Plevins and "The Old Gang" in charge of the aircraft, all he needs to do is to know the rules, keep smiling, and show a decent spirit by getting at least as wet as the people who are doing the work!)

Let us take the eliminating contest first. This involved a reasonably difficult course of over 1,200 miles across country, thereby ensuring that the finishers were capable navigators and that their engines were thoroughly reliable. It may be argued that it would have been much better on a course of this length to run it right round Great Britain rather than twice round the southern half of England. I have considerable sympathy with this argument, but it must be borne in mind that the longer course means greater expense in organisation, and a greater risk of interference by weather conditions, while the results so far achieved have shown that no greatly increased "gate" may be expected by reason of the longer course. It was hoped that the shorter course, traversed twice during the day, might result in increased public interest at the control aerodromes. Under the old system the early control aerodromes had little hope of attracting any gate during the morning, whereas under this year's system each control could offer the spectacle of the machines arriving and refuelling both during the morning and during the afternoon.

The fact that 50 per cent. of the starters in each class were eliminated has been criticised, and undoubtedly this was liable to lead to hard luck in certain cases. Actually, in the result, it worked out pretty fairly and there was considerable justification for it in theory. If the eliminating trial was to be made into anything more than a mere reliability contest, it was essential to eliminate a certain number. Assuming that 25 per cent. eliminated themselves, this left only 25 per cent. to be eliminated on speed. It

What We Said

THAT the conditions of the race should be so framed that some particular aeronautical purpose would be served.

That the race might be made to tell the world that British civil aeroplanes really are fast.

That the rules should encourage the entry of machines which combined speed with other useful civil or commercial qualities.

That real efforts should be made to arouse the interest of the public.

That the present method of running a scratch eliminating race and a handicap final is unfair and unsatisfactory.

(Further editorial comment appears on page 125.)

gave every incentive to the slower pilots in each class (a) to clean up their machines in order to obtain maximum performance, and (b) to use their brains as to how much petrol to carry and to bring their fuel pit organisation to the highest possible point of efficiency. It also meant, having regard to the comparatively narrow margin between the fastest and the slowest machines in each class, that few of the faster pilots could afford to loiter or to indulge in errors of navigation, while they had every incentive to go full out, having regard to the prize for the fastest time in each class, which was by no means negligible in actual cash and had a certain publicity value in addition.

For the final on the second day, the rules were admittedly calculated to provide the closest possible finish between those whose performance and skill had got them into the final, and in consequence to provide the best possible spectacle for the public. It would be unfair, however, to suggest that only spectators were considered. The handicappers allowed for the fact that the fastest machines were bound to lose a certain amount of time in cornering over a short course, and based their handicaps on the best possible performance which could be expected of each machine in the hands of a perfect racing pilot round the course. In the result, the final was not merely a test of the handicappers' skill, but also a test of the pilots and of their machines. It meant that the pilot who was merely a skilful navigator without being also a skilful racing pilot would fail in the final. Taking it all round, I do not think it can be denied that the rules as formulated mean that the winner must (*a*) be a skilful navigator, (*b*) be a skilful racing pilot, and (*c*) be flying a machine which was above the average for its class in efficiency, had a reasonably good view, and was fitted with an engine which would stand up to long periods of maximum r.p.m. In addition to this it provided for the public a spectacle which under happier weather conditions would have been about as interesting as anything short of sheer pylon racing could hope to be in this line.

Alternatives

What are the alternatives proposed to the race in its present form? A frequent suggestion is that the course should be altered so as to provide either (*a*) something in the nature of a pylon race, or (*b*) a course round London as for the old Aerial Derby, or (*c*) a really stiff course round Great Britain as a whole. The answer to the first is that it would be no test of anything except the sheer racing skill of the pilot, and would merely tend to encourage a particular type of aeroplane which would not be much use for anything else.

The idea of a course round London is barred by a very proper stipulation on the part of the Air Ministry to the effect that the course shall not cross the main passenger air routes to the Continent.

The course right round Great Britain is attractive from many points of view as a test of pilotage and navigation, but involves considerably greater expense in organisation without the prospect of a corresponding return, and renders the race particularly liable to postponement by reason of weather conditions. Moreover, if the result of the race depends on this one course alone the finish is likely to provide no spectacle for the public at all, since it is too much to hope for anything like a close finish over such a distance.

The next most popular suggestion is that the handicapping should be by formula instead of on known performance. Apart from the fact that it seems a pity to waste the knowledge and experience of Messrs. Dancy and Rowarth, probably the finest handicappers in Europe today, there are serious practical difficulties in adopting a formula handicap. The S.B.A.C. has never been able to agree jointly upon a formula, and, from my limited experience, it is the most difficult thing in the world to get experts to agree upon. Moreover, when they do agree I find that I, as a non-technical man, am in complete disagreement with the result from a practical point of view (which may, of course, be my own stupidity, but only goes to show how difficult the problem is to solve).

Even if some mutually agreed formula could be devised, there is no reason to suppose that the aircraft manufacturers would support such a race at the present time. The Aerial Derby handicap died owing to lack of support from the manufacturers, and the risk of this would be even greater now, when the great majority of them are busy on Government contracts.

Finally, the experience of foreign aero clubs in trying to run really scientific formula competitions on the "challenge de tourisme" lines seems to show that they are a very expensive proposition to organise and that they tend to produce freak types of aircraft rather than genuinely useful commercial or touring types.

The Venue

It is argued that Hatfield is a bad starting and finishing point, and that either the starting and finishing point should be moved round each year, or a point much nearer London should be chosen. Some people say that if an aerodrome to the east of London, such as Abridge, were selected, we should get crowds of spectators from the East End. Others say that Londoners are too *blasé* to go to an air race, wherever you may have it, and that the only hope is to go into the provinces. In the early days we tried moving it round year to year, but finally decided to give a fair trial to the idea of stabilising it at one point in the hope that it might become associated with that particular aerodrome in the public mind in the same way as the R.A.F. Display and Hendon.

It is, I think, too early to say yet whether that policy will be successful or not (this year was the third at Hatfield), but, considering the miserable weather conditions, the attendance the other day was by no means bad. As to whether Hatfield is the best aerodrome, it is certainly the most readily accessible aerodrome, within reasonable reach of London, which offers the possibility of laying out a course over open country in the immediate vicinity. The East and South of London are barred by reason of the Continental air routes, and the West is not much better. It must be borne in mind that, after every King's Cup Race, complaints of low flying are received. There are still far too many competitors who cannot resist the exhilaration of hedge-hopping in a race, even when they have a good tail wind behind them. It is impossible to lay out a course entirely over open country, but unless there is to be a public outcry against air racing generally it is vital to avoid, as far as possible, the areas where low flying can give serious grounds for complaint.

Round the Clock

The *Douze heures d'Anger* (or, as it is irreverently nicknamed, "Douze heures de danger" or "douche d'angoisse"!) is advocated by many as the solution. They argue that, because crowds are attracted to Brooklands for motor races on similar lines, equal crowds would be attracted by such an air race. This point is open to argument, but there is definitely a good deal to be said for the running of such a race. The great point in its favour is that it would give a chance to the manufacturers of all types of aircraft, from the largest to the smallest, since the races would be split up into classes. Each class would presumably be given a minimum number of laps to be completed within a specified period (not necessarily twelve hours—what about the "Eight hours of aerial 'ate" as a public draw?), and the winner of each class would be the machine which completed the greatest number of circuits in excess of the qualifying minimum. Frankly, I would like to see such a race tried out in England, both British and foreign manufacturers being free to enter and the classes so divided as to provide for all types of aircraft, whether civil or military, from the smallest to the largest. I must admit, however, that I am a little doubtful as to the number of entries at the upper end of the scale, or of Service types, but we might get some foreign entries

from manufacturers who hoped to sell a licence in this country.

In any case, such a race would settle these doubts and would at the same time give much-needed encouragement to the manufacturers of ultra-light aircraft, who at the moment are barred from the King's Cup Race, although they of all firms are most likely to support air racing for its advertisement value.

On the other hand, I see one grave difficulty about making such an event the King's Cup Race. There is only one King's Cup to be awarded, and the problem would arise as to who should be considered as the winner. To award it to the winner of the unlimited class, which might consist of only two or three machines, would obviously be unfair. On the other hand, to award it for the most meritorious performance in any class would need the judgment of Solomon.

Looking at the problem as a whole, my present view is that the most satisfactory solution for next year's race would be to run it from the same point and on similar lines to this year, but with certain detailed modifications, including the following:—

1. An increase in the ground covered by the eliminating contest, including turning points at popular resorts, so as to extend public interest further afield. The difficulties in connection with the cost of organisation could be met by having a minimum number of compulsory checking points, while the risk of interference by weather must be faced if the event is to be of a really national character.

2. A revision of the class divisions so as to attract a wider entry if possible.

3. A revision of the method of elimination so as to ensure that, at any rate, the bulk of those who fly a good course and maintain a speed reasonably near to the maximum shall qualify for the final.

If the final is again to be flown round a comparatively short circuit, there must necessarily be some limit to the number of machines which can be admitted, but this year's race seemed to show that a considerably greater number could have been flown round the final circuit without undue risk.

I hope that neither the Editor nor his readers will think that this article implies any resentment of the criticisms which have been raised by *Flight*. On the contrary, I personally welcome them, as it is only by means of sound and intelligent criticism that progress is achieved. The object of this article is merely to set down, necessarily in very much condensed form, some of the problems which beset the organisers of such an event and to give readers an opportunity of providing a solution to those problems and thereby to assist, not only the organisers, but the general development of civil aviation.

In conclusion, I realise that my suggestion for next year's race is open to criticism on the grounds that it is a compromise, one of the points already criticised by *Flight* as regards past races. The answer to such criticism is that, unless it is to be limited to the encouragement of one object at the expense of all others, the contest must necessarily be in the nature of a compromise. Two attempts at least have been made in the past to concentrate on one objective. Each experiment resulted, wisely, I think, in a return to a compromise. After all, what is life itself but a compromise? And is not the aeroplane itself the greatest compromise of all?

Hungarian International Meeting

THE motor sport, flying, and yachting section of the Magyar Athletic Club is organising, with the approval of the Hungarian Aeronautical Association, a two days' international competition, which will be held on September 4 and 5.

There is an entry fee of 50 P. per aircraft, and entry forms and full particulars may be obtained from the Secretary, Royal Aero Club, 119, Piccadilly, London, W.1. Entries close on August 20. Late entries at double entry fee will be received up to August 30.

R.Ae.C. and the Air Navigation Bill

THE Royal Aero Club, acting in conjunction with the Air Touring Department of the Automobile Association, and with the assistance of the Motor Legislation Committee, has recently been putting in a great deal of work on behalf of pilots and aircraft operators.

The Bill, as originally drawn, imposed heavy obligations upon users of the air without any corresponding compensations. Many amendments were proposed and accepted before the Bill reached Parliament, while further amendments were carried through on the Committee stages of the Bill.

The principal points upon which complete, or partial success, was achieved, were the following:—

Reduction of the maximum third party liability in the case of gliders and light aeroplanes.

Limitation to apply unless wilful misconduct proved against the person responsible.

Right to trial by jury in the case of the more serious piloting offences.

Questions dealing with the lighting or removal of obstacles near aerodromes and the prevention of trespass on aerodromes.

The Club wishes to acknowledge its indebtedness to the members of the Parliamentary Air Committee, and to the A.A. and the Motor Legislation Committee for the assistance received throughout the passage of the Bill.

Poux at Ramsgate

VISITORS to Ramsgate will have an opportunity to see a somewhat unusual spectacle on August Bank Holiday, when eight *Poux-du-Ciel* will race for prizes offered by the proprietors of the new Ramsgate Airport, which is one of the chain of aerodromes now being operated by Mr. Whitney Straight.

The meeting opens at 2 p.m., and the usual flying demonstrations, aerobatics and parachute descents will entertain visitors. There is no doubt that to the technically minded the new cabin *Pou*, which will be demonstrated by M. Henri Mignet himself, will be one of the greatest attractions. This machine is reported to fly very well, and as it differs from the original *Pou* in several respects, apart from its cabin, enthusiasts will look forward to seeing how it flies.

Five British and three French pilots will compete in the race, which is to consist of four laps of a seven-mile course, and is due to start at 4 p.m. The visiting French pilots are E. Bret, who will pilot M. Mignet's own single-seater *Pou*, R. Robineau, who will fly Mr. Proctor's machine, and Jean Colli, whose mount will be the Carden-Baynes cantilever *Pou*. F./O. Clouston and Messrs. S. Appelby, C. A. Oscroft, and R. Parker will pilot British *Poux*, and a fifth has been entered by the Cheltenham Light Aero Club.

Forthcoming Events

August 1. Cinque Ports Club: Folkestone Trophy Race.
August 1-3. Yorkshire Gliding Club: Open Meeting.
August 2-15. Yorkshire Gliding Club: Instruction Camp.
August 3. Ramsgate Airport: *Pou-du-Ciel* Race.
August 8. Newcastle Aero Club: London-Newcastle Race.
August 8. Reading Aero Club: Northesk Cup Competition for Women Pilots.
August 15. Eastbourne Flying Club: "At Home."
August 15-30. Yorkshire Gliding Club: Open Meeting and Competitions.
August 22. Midland Aero Club: "At Home" and Contact Air Race.
August 28-29. Southend Flying Club: Week-end "At Home."
August 29-30. Cinque Ports Club: International Rally and Wakefield Cup Race.
August 29-Sept. 6. British Gliding Association: Annual Competition, Gt. Hucklow, Derbyshire.
August 30. Gordon Bennett Balloon Race, Poland.
September 4-5. Magyar Athletic Club Motor Section: International Flying Meeting.
September 5. Bristol and Wessex Aeroplane Club, and Bristol Branch, R.Ae.S.: Garden Party.
September 5-6. Aero Club of Hungary: Week-end Aerien.
September 12. London Aeroplane Club: Hatfield Garden Party.
September 13. Aero Club de France: Coupe Deutsch Race.
September 15. London-Johannesburg Race.
September 19. Cardiff Aeroplane Club: London-Cardiff Race.
September 20. London Air Park Club: Display.
October 25. Aero Club de France: Saigon Race.
November 13-29. International Aero Exhibition, Paris.

Private Flying

Topics of the Day

Wind Indication

WHENEVER I find myself journeying by air to strange aerodromes I always find time to wish that someone would invent a really adequate means of wind indication—or, at least, that all the aerodrome owners would do everything in their power to provide the maximum number of indication points by known methods.

Within the past month I have visited at least two aerodromes at which the direction of the wind was inadequately shown. In one case, two circuits, at five hundred feet in perfectly clear weather, had to be made before the single windsock was discovered. This was so obviously affected by the adjoining buildings that it was necessary to make a landing on the approximate estimation which every pilot has at the back of his mind during a cross-country flight.

In any case, windsocks are so difficult to see and erratic in their action that every aerodrome should also have either a fairly sensitive Tee or a smoke smudge. The socks would then need to be used only to obtain a finally accurate placing while crossing the fence on the way in and while preparing to take off.

We all admit that these things are irreplaceable when absolute accuracy is required, and one or two machines are sensitive enough in cross-wind landings or take-offs to make accuracy an essential. Incidentally, a Tee is of inestimable value when machines are expected in large numbers in a flat calm at an aerodrome with equal dimensions; the thing can be set to give the best approach and run in the prevailing circumstances.

Rumbling

DURING the Week-end Aérien one of the French pilots, in explaining the approach and landing characteristics of his very fast machine, brought the old rumbling question up again, and, later, an English pilot put up an unanswerable argument in favour of engine approaches for certain circumstances.

He said that an engine which had been on half or two-thirds throttle at intervals on the way in will be a far more reliable affair than one which has been windmilling round for three or four minutes. A slight misjudgment, or the appearance of an unexpected obstruction, might demand full throttle just as the hedge is being crossed, and a coldish engine sometimes hesitates—particularly when the throttle is suddenly opened. Although there is rather less chance that an engine failure will occur while rumbling in this way than when flying at cruising revolutions, such a failure would be a good deal more serious.

Transport Technique

HOWEVER, it might appear that there is room in every club curriculum for a rumbling class, since it is obviously a difficult thing to do with accuracy. The majority of accidental rumblers apply far too much engine suddenly and cross the boundary at the sort of speed which gives the watching instructor cause for heavy complaint.

More than one instructor has claimed that, whereas real forced landings carried out according to the rules are usually successful, bad weather or visiting-your-friends' field landings, made with bursts of engine, are often far from being so.

There are occasions when it is advisable to drop a machine just over the hedge, and it is only possible to do so with clever throttle work. Let us, therefore, either learn to rumble properly or abjure the engine at all times. Which reminds me that our light aeroplanes are slowly leaving an ideal behind—the ideal which enables one, with full load, to depart from any field in which it is possible to land. I consider that a short take-off and steep climb are more important than a short landing. To roll into a hedge is nothing—to fly into it is the very devil.

Incidentally, the French pilot mentioned in the previous column said that it was only possible to bring his machine in at a reasonable speed on a whiff of throttle, since it allowed him to hold the nose up, and gave him the necessary rudder control. With a dead engine it was a somewhat dangerous projectile, but with life in the nose it could be brought in at little more than 50 m.p.h. with safety. New designs, new technique. Luckily, engines are becoming more and more reliable.

Bad Weather View

A FORTNIGHT ago I spent a very interesting half-hour in the control cabin of the latest R.A.F. rescue boat, built by the British Power Boat Company. While travelling at 35 knots in a far-from-calm Solent, spray and real green sea were taken aboard in large quantities, and without some special device the helmsman might have been blind behind his screen for dangerously long periods in an area of water which is covered with buoys and lightships as completely as a reconditioned aerodrome is covered with red flags.

In the centre panel was a slinger ring, consisting of a separate disc of glass which is rotated at a very high speed by means of an electric motor. At the very worst, that disc was not opaque for more than three or four seconds, such is the effect of plain centrifugal force. I was told that it worked equally well in snow, though, presumably, ice might cause a little trouble.

The question is: Would a slinger ring of this kind, specially designed for aircraft, be too heavy? Even if weight considerations barred its use in light aeroplanes, the bigger transport machines should be able to make use of the idea—and heaven knows that little can be seen through the screen of the best aeroplane in heavy rain. In order to remove the weight of an electric motor, the ring might be spun by the airflow.

INDICATOR.

Private Flying

FROM the CLUBS

Events and Activity at the Clubs and Schools

HANWORTH

WITH two non-flying days, last week the London Air Park Club flew 76 hr. 45 min., included in which was a first solo by Miss Pearl Knight. Two club machines "attacked" Brooklands on Sunday and one got through. Capt. C. Lloyd is taking an instrument-flying course.

DONCASTER

Machines of the Doncaster Aero Club flew 30 hr. 20 min. during the week ending July 22. Miss Beale and Mr. Sinclair have joined.

PORTSMOUTH

Bad weather and high winds prevented flying by the Portsmouth Club during the greater part of last week and the total until July 24 was only 27 hr. 10 min. However, eight members joined.

C. A. S. C.

Last Sunday members flew 7 hr. 15 min. and four of them flew to Broxbourne for tea. Mr. Drew has joined the Corps as a probationary member and Mr. Reymond is a full member.

LEEMING

During last week five new members joined the Y.A.S. Country Club as pupils of the school. Mr. Barnett made a first solo and Messrs. Monteith and Crichton completed their "A" licence tests. Seventy-five hours were flown between July 18 and 25.

REDHILL

The flying hours for the week ending July 24 at the Redhill Club amounted to 45 hr. 55 min. Five machines, two Belgian, two Dutch, and one German, on their way to Heston, took refuge at Redhill from the inclemency of the English summer weather.

READING

Last week Herr Von Bleichreder passed his "A" licence tests at Reading, where 23½ hr. were flown. Major Higman, from Barcelona, and the owner of a Hawk Major, and Mrs. Brady, a pupil from Kenya, are staying at the club. Other new pupils are Messrs. Daffhorn and Van Dours.

MIDLAND

High winds prevented flying on four days last week and solo and instructional flying amounted to 24 hr. 30 min. only. Cross-country flights were, however, made to Tollerton, Filton, Walsall and Hatfield. Messrs. A. White and J. Round have made first solos.

NORTHAMPTONSHIRE

Better weather during the last week has influenced flying hours at Sywell, and Capt. Sir P. Grant-Lawson, Mr. R. Eyton-Williams, Col. A. R. Liddell and Mr. J. W. Russ (who has become a temporary flying member whilst on holiday from America) have been busily engaged getting in some flying time. On Sunday, July 26, the club made a dawn patrol raid on Brooklands. Five private machines flew in formation to the Leicestershire Club on Wednesday, with seven associate members, chosen by ballot, as passengers. Since the opening of the new clubhouse on June 7 seventy new members have been enrolled.

AT RATCLIFFE : Hebe immobile while Mr. Lindsay Everard, M.P., addresses his Week-end Aérien guests. (*Flight* photograph.)

YORKSHIRE

Club machines flew 47 hr. 25 min. last week at Yeadon, though flying was impossible on two days. Trips were made to and from Blackpool, the Isle of Man and Leicester. New flying members are Mr. E. S. Bolton and Mr. S. E. Moorhouse.

KENT

Seventy-seven hours were recorded up to July 17 at Bekesbourne and Messrs. Simpson and Howard carried out first solos. The C. of A. renewal on the club's latest acquisition, a Falcon, has just been completed. It is now available for charter work, joyriding and club flying.

NORTH BRITISH

During the past week, although held up by bad fog for three days at the beginning, the North British Aero Club has managed to keep flying times going steadily. Mr. Donald has taken his "A" licence. Among new flying members is Mr. McBain.

CAMBRIDGE

Flying times at Marshall's Flying School, The Cambridge Aero Club and the University Aero Club, for the week ending July 26, totalled 70 hr. It has been an extremely bad week for instructional flying owing to squalls and heavy rain, and on the 21st and 23rd no flying was done at all. On the 24th the aerodrome was visited by twenty-five machines connected with the Week-end Aérien. Miss Pooley has joined the school and Mr. Grattan-Bushe has completed his first solo. Messrs. Shinner, Morris and Grattan-Bushe completed their "A" licence tests.

YAPTON

Flying times at Yapton for the month until the 25th amounted to 111 hr. 45 min. No. 4 Squadron is now at the aerodrome for its annual co-operational manœuvres with Army units. The club held a "cocktail patrol" on Sunday for a half-hour after noon and were "attacked" by twelve visiting machines. Only Messrs. Cain and Ken Waller, from Brooklands, were successful in passing the defence with their letters unread. Eleven members, in four machines, went to Brooklands for their dawn patrol on the same day and only two had to pay for their own breakfasts.

BORDER

The holiday season is resulting in increased joyriding at Carlisle. On Sunday of last week a motoring party of fifty visited the aerodrome and many flew in the club's new Hornet Moth and on the next day a party of nine American students on a bicycle tour of the North also flew; only one had flown before. The club's engineer, Mr. R. Blair, left at the end of last week to take up a post with the Scottish Flying Club. His place is being taken by Mr. Rigg.

Flying is getting into swing again after the interval through lack of aircraft. The Hornet and the original Gipsy II Moth (G-ABGM) are both available, and—"JH" should now be back after C. of A. renewal.

BROOKLANDS

During last week there has only been one suitable day for flying and on this Miss Murless and Messrs. Lovell, Craw and Hanson made first solos. Mr. W. Harrison is a new pupil. Mr. T. H. Jackson, works manager of the Cinque Ports Flying Club, and a former graduate of the College of Aeronautical Engineering, has now obtained his "B" licence.

On Saturday next, August 1, there will be an informal dinner-dance at the clubhouse.

Brooklands was attacked on Sunday, between 08-00 hours and 08-30 hours, by thirty-five machines. There were nine defenders and the tactics of the defenders was changed from the normal practice, and the machines circled the eight mile radius at a height of 2,500 ft. Twelve attackers managed to land unobserved and twenty-four free breakfasts were provided. Six machines from Brooklands flew to Yapton to take part in a lunch patrol, but only one machine managed to get through the defences.

CINQUE PORTS

In spite of the unpleasant weather conditions during the past week, the club managed to keep busy, several long cross-country flights having taken place. Among these was one from Lympne to Scotland and return, made by a member in the Club Aeronca. Only one quart of oil and thirty gallons of petrol were used. Mr. and Mrs. Symmons and Mr. D. Palmar, who flew in the Leopard to the Frankfurt party, were very impressed with their visit. Several of the Lympne private owners also went over.

On Thursday, of course, one of the nastiest days of a nasty summer, dozens of foreign aircraft descended at or near Lympne. So bad was the visibility that several machines could not get into Lympne and were forced down into Littlestone or the surrounding marshes. Many hours were spent in retrieving pilots and passengers from all sorts of awkward places.

Mr. S. W. Ogden has now passed all his "B" licence tests, while first solos were carried out last week by Mr. E. A. Strouts and Mr. F. G. Whitnall.

NORFOLK AND NORWICH

Two very windy days at Mousehold last week did their best to reduce the flying hours, but in spite of this over forty-five were recorded. Messrs. J. L. Chandley and J. S. Edge completed their first solo flights. The club will not be flying next Monday and Tuesday, and on Wednesday the third public school aviation camp will commence, again in charge of Dr. Harold Birchall, of Taunton.

SOUTH COAST

Several new members started instruction during the week ending July 25 though bad weather upset flying. Mr. I. Campbell-Bruce has passed his "A" licence tests. The Drone is being demonstrated at Shoreham on August 2 and the first round of the Gorringe Challenge Trophy (a forced landing competition) will be held on August 9.

EASTBOURNE

Some details of the Eastbourne Flying Club's At Home, which will be held on August 15, have already been given in these notes. Between 2 and 2.30 p.m. an arrival competition will be held, followed by demonstrations of the latest types of civil aircraft. Promises of appearance have already been received from Flt. Lt. T. Rose, Mr. R. A. C. Brie, Mr. Kronfeld, British Aircraft, General Aircraft, and from a number of others. Weather permitting, a parachute descent will be made by Mr. Gerald Hill. Cups are being given in a Concours d'Elégance for open and closed machines.

A Midland Classic?

THERE is every indication that the *Contact* handicap air race, which was held last year for the first time, may develop into a Midlands classic.

Owing to the generosity of certain well-wishers the prize fund is considerably larger this year and the cash prize of £100 for the winner is high enough to attract the right sort of entry.

Five short legs, totalling a distance of 170 miles, will be flown from Castle Bromwich, and there will be four control points (at Sywell, Braunstone, Tollerton and Meir) where time on the ground will count as flying time. The winner will receive the Lord Austin of Longbridge Trophy, together with a cheque for £100 from the Austin Motor Co.; the second man will receive the Midland Trophy and £20; and the third will receive £10. The Dunlop Rubber Company has presented a trophy for the fastest competitor, who will also receive £20.

Further information and entry forms, which must be returned by August 12, can be obtained from the Secretary, Midland Aero Club, Castle Bromwich, Birmingham.

DRONE REFINEMENTS

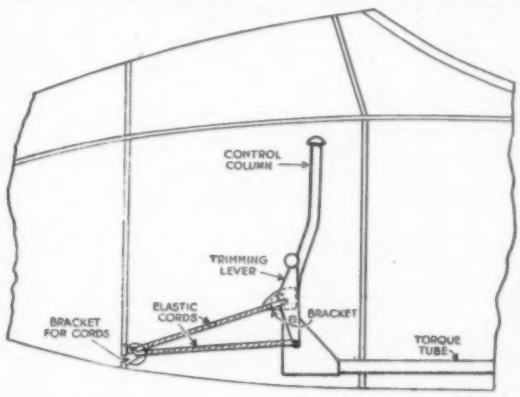
A Special Super Drone for a Northern Enthusiast : Mechanical Self-starter and Trimming Gear Fitted

ALTHOUGH the first Super Drone to be equipped with a mechanical self-starter and a simple trimming device has actually been made to the order of Mr. Thomas, a Northern gliding enthusiast, it is understood that any future Drones will be so equipped at a small extra cost to the purchaser. This addition, in the case of the starting mechanism, is a matter of £7 10s., and should be worth while, particularly to anyone who wishes to be less dependent on outside assistance while ground-handling his machine.

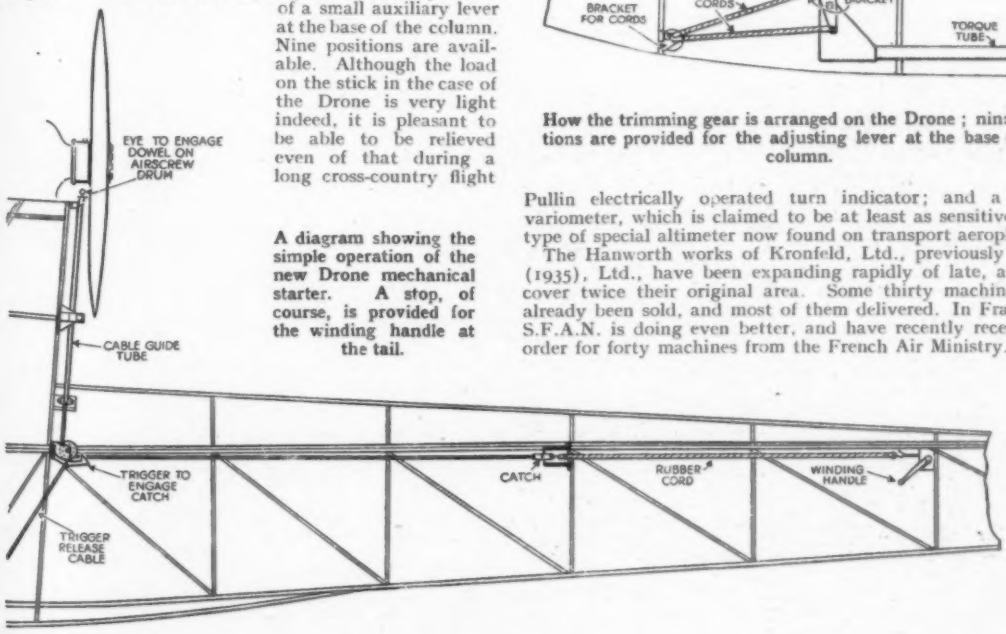
The mechanism is very simple and straightforward, involving a length of shock cord to which the starting cable is attached; a permanently placed handle near the tail to stretch the cord after the cable has been wound round the airscrew drum; and a trigger to hold the cord in tension while the pilot enters the cockpit. In order that starting shall be made more certain, a choke control is fitted, and this can be operated from the pilot's seat.

The new trimming gear is extremely simple and effective, and is reminiscent of that fitted to the Desoutter. Elastic cord is stretched between the control column and the front of the cockpit, and the tension on this may be adjusted by means of a small auxiliary lever at the base of the column. Nine positions are available. Although the load on the stick in the case of the Drone is very light indeed, it is pleasant to be able to be relieved even of that during a long cross-country flight or during an approach to the aerodrome from a reasonable height.

Mr. Thomas' machine is fitted with a number of special instruments, including a full-size Sestrel Mk. IIA compass; a Pullin electrically operated turn indicator; and a Collins variometer, which is claimed to be at least as sensitive as the type of special altimeter now found on transport aeroplanes.



How the trimming gear is arranged on the Drone; nine positions are provided for the adjusting lever at the base of the column.



A diagram showing the simple operation of the new Drone mechanical starter. A stop, of course, is provided for the winding handle at the tail.

The Hanworth works of Kronfeld, Ltd., previously B.A.C. (1935), Ltd., have been expanding rapidly of late, and now cover twice their original area. Some thirty machines have already been sold, and most of them delivered. In France the S.F.A.N. is doing even better, and have recently received an order for forty machines from the French Air Ministry.

THE INDUSTRY

Plugs Play Their Part

THE equipment of the machine which won the recent Portsmouth to Shoreham race, Mr. S. T. Lowe's Comper Swift, included K.L.G. sparking plugs.

Thirty-five Years

ON Wednesday of last week, in London, a large gathering of executives of the Vacuum Oil Co. celebrated the completion of thirty-five years' service by Mr. Hubert Holliday, managing director of the firm.

About Electricity

EXECUTIVES of aircraft factories in which electrical power is utilised to any large extent will find a great deal of useful information in a pocket book recently issued by Brook Motors, Ltd., Empress Works, Huddersfield. Electrical data and legal requirements as regards wiring are among the many subjects covered.

Parnall Capital Increase

AT an extraordinary general meeting of Parnall Aircraft, Ltd., shareholders considered a resolution to increase the capital from £300,000 to £450,000 by the creation of 600,000 new ordinary shares of 5s. each. The chairman, Sir Louis Vaughan, said that important orders in connection with the defence programme would keep the company's factories operated to capacity for two or three years, in addition to which they had rendered, and would continue to render, a great deal of technical service to the Government and to aircraft constructors on design and development.

Something New in Hangars

A SYSTEM of building construction which is new to this country and which is particularly applicable to aircraft hangars, has been introduced by Diagrid Structures, Ltd., Horseferry House, Millbank, London, S.W.1.

The accompanying sketch illustrates the front elevation of a reinforced concrete aeroplane hangar on the Diagrid system, with an unobstructed door-opening over the whole frontage. As can be seen, the internal construction consists of beams which run diagonally to the boundaries, and are interlaced with each other. This construction, states the makers, not only results in a very pleasing appearance, but owing to the intimate interlacing of the beams guarantees utmost rigidity and strength against outside influences, even those of an unforeseen nature.

The fundamental idea can, of course, be applied to any required type of hangar, i.e., to any possible shape in plan or cross-section and any arrangement of doors.

The system makes it possible to arrange extremely wide door-openings in any desired position without requiring expensive door-girders.

Apart from the heavy hangars in reinforced concrete, which can also be built underground, and are bombproof, Diagrid construction is also applied to light hangars; in this case structural steel or timber is used, or a suitable combination of the two materials. The light type can easily be taken to pieces, removed and rebuilt anywhere within a short time.

Prices of Diagrid hangars range according to type, span and purpose between approximately 1d. and 4d. per cu. ft. of contents. The makers state that they can furnish schemes and estimates without obligation.

NEW COMPANIES

In the notes below, for reasons of space, the "objects" of new companies are usually somewhat abbreviated.

MATERIA, LTD.—Private company. Registered July 13. Capital £100 in £1 shares. Objects: To acquire stock, shares and securities, etc. The directors are: Oliver E. Simmonds, Pelham Mount, Esher, Surrey (director of Simmonds Aerocessories, Ltd., and Neville's (Liverpool), Ltd.), and Mrs. Gladys E. Simmonds (director of Simmonds Aerocessories, Ltd.). Registered office: 18, Essex Street, Strand, London, W.C.2.

LANDING GROUNDS CORPORATION (GREAT BRITAIN), LIMITED, was registered as a private company on July 13, with a nominal capital of £10,000 in £1 shares. Objects: To carry on business as contractors, constructors of aerodromes, landing grounds, etc. The first directors are Edward Goddard and Joseph E. Bradrick.

ALVIS-STRAUSSLER, LIMITED, was registered as a private company on July 13, with a nominal capital of £5,000 in 1s. shares. The objects are to carry on the business of manufacturers of and dealers in automobile, aero, agricultural, commercial, marine and other engines, vehicles, tractors, aircraft and vessels of all descriptions, scientific instruments and apparatus of all kinds, and all parts and accessories thereto, manufacturers of and dealers in munitions, engineers, etc. The first directors are to be appointed by the subscribers. Solicitors: Slaughter and May, 18, Austin Friars, London, E.C., and Simmons and Simmons, 1, Threadneedle Street, London, E.C.

STELLA AERO PLYWOOD COMPANY, LTD.—Private company. Registered July 18. Capital £1,000 in £1 shares. Objects: To carry on the business of dealers in wood, sawdust, wood shavings, wooden blocks, plywood, aeroplanes, etc. Edward Michaelis, of 56, Kingsway, London, W.C.2, is sole director. Registered office: 46–7, London Wall, London, E.C.2.

INTERNATIONAL AIRSHIP, LIMITED was registered as a private company on July 17 with a nominal capital of £100 in £1 shares. The objects are to operate airlines. The directors are: John W. R. M. Salusbury-Trelawny, 15, Collingham Place, London, S.W.5, and James A. Sinclair, Trowlock Island, Teddington, Capt. R.A.F. (Ret.). Registered office: At 3 and 4, Clements Inn, London, W.C.2. The file number is 316,555.

INCREASES OF CAPITAL

WRIGHTWAYS, LTD. (Aircraft designers and manufacturers, etc., Airport of London, Croydon).—The nominal capital has been increased by the addition of £14,000 beyond the registered capital of £6,000. The additional capital is divided into 4,000 preferred ordinary and 9,950 unclassified shares of £1 and 1,000 deferred ordinary shares of 1s.

HANDLEY PAGE, LTD. (40, Claremont Road, Cricklewood, London, N.W.2).—The nominal capital has been increased by the addition of £116,965, beyond the registered capital of £206,644. The additional capital is divided into 467,860 ordinary shares of 5s. each. The 150,000 ordinary shares of 1s. have been converted into £7,500 ordinary stock; the 497,860 preference shares of 8s. into £199,144 preference stock; and the 467,860 new ordinary shares of 5s., into £116,965 ordinary stock.

AERONAUTICAL PATENT SPECIFICATIONS

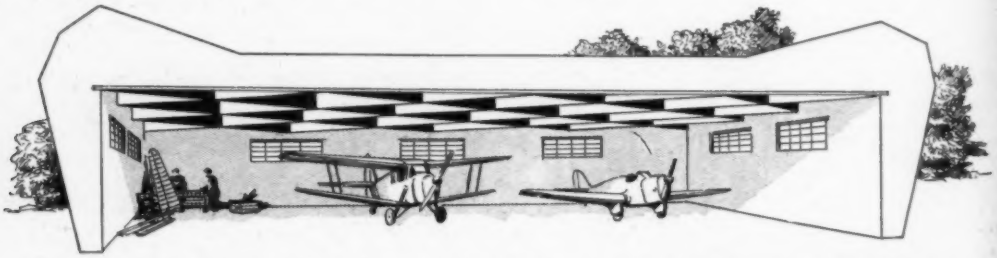
(The numbers in brackets are those under which the Specifications will be printed and abridged, etc.).

(Published July 23, 1936.)

18262 HILLIER, A. (Sperry Gyroscope Co., Inc.): Bomb-sights for aircraft (449,238).
33746. MILNER, H. L.: Controllably variable-pitch airscrews (449,247).
36745. G. Q. PARACHUTE CO., LTD., QUILTER, R. C., and GREGORY, J.: Parachute packs for aviators (449,324).
36746. G. Q. PARACHUTE CO., LTD., QUILTER, R. C., and GREGORY, J.: Parachute harness (449,325).
36754. JABLONSKY, B.: Method and apparatus for silencing the exhaust of aircraft engines (449,187).
224. RUBBRA, A. A., and GASS, E. A.: Variable-pitch airscrews (449,407).
26712. VICKERS (AVIATION), LTD., and WALLIS, B. N.: Gun mountings for aircraft (449,234).
31069. ARMSTRONG WHITWORTH AIRCRAFT, LTD., SIR W. G., MURRAY, C.V., and LLOYD, J.: Gun mountings, particularly for aircraft (449,235).
27359. VICKERS (AVIATION), LTD., and WALLIS, B. N.: Gun mountings especially suitable for use on aircraft (449,236).
27431. VICKERS (AVIATION), Ltd., and WALLIS, B. N.: Adjustable seats particularly suitable for use on aircraft gun mountings (449,237).

(Published July 30, 1936.)

36607. SWAN, A., GRIFFITH, A. A., and HELMORE, W.: Means for automatically preventing detrimental ice formation on aircraft (449,532).
36989. HARLAS, J., POHANKA, R., and TECHNICKY PRUMYSL AKCIOVA SPOLECNOST: Method and apparatus for determining the course of aircraft by means of the acoustically measured elevation and azimuth of the aircraft (449,610).
244. DOWTY, G. H.: Hydraulic-locking devices, more particularly for aircraft undercarriage or other controls, or like purposes (449,876).
4247. HAWKER AIRCRAFT, LTD., and CAMM, S.: Adjustable and folding seats (449,700).
5406. BENDIX, LTD., and LAMBERT, A. W.: Brake control mechanism for aircraft (449,702).
16494. FAIREY AVIATION CO., LTD., FAIREY, C. R., and FORSYTH, A. G.: Worm reversing gearing (449,586).
25087. CESKOMORAVSKA-KOLBEN-DANEK CO., LTD., and SLECHTA, J.: Undercarriages for aircraft (449,728).
33812. SOC. ANON. AEROPLANI CAPRONI: Air Propellers with variable pitch (449,664).
4884. SERVICE, G. A.: Vehicle and aircraft remote directional lamp-reflector control (449,748).



One of the smaller types of Diagrid hangars, referred to above. Note the distinctive roof construction.